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Editorial

In May of 2011, following the SEL congress in Luxembourg, I accepted the position of editor-in-chief of *Nota lepidopterologica*. Matthias Nuss, who had been the editor for 11 years, first with Konrad Fiedler as a co-editor from 2000 to 2003 and then with Bernard Landry since the end of 2006, transferred the journal into my hands. Matthias and Konrad shepherded *Nota* into the 21st century by bringing it into conformance with contemporary scientific journals through the use of peer-review and by modernizing its layout. Matthias and Bernard have continued this process by maintaining a high academic standard for the acceptance of submitted manuscripts. I will endeavour to follow their lead. Matthias and Bernard will continue their involvement with the production of *Nota* at many levels, as pyraloid and German and French manuscripts editors, respectively, and as editorial board members. Their long experience with *Nota* and their willingness to help has been invaluable during my first year as editor-in-chief.

Based on the experiences of Matthias and Bernard, it has become clear that the workload for one or two editors is much too large, especially as being an editor is entirely voluntary. Thus, after discussion among the editorial board members, we have implemented a strategy by which *Nota* is relying on a number of subject editors. The subject editors will be responsible for editing manuscripts related to their specific areas of research. The subject editors include Sven Erlacher (Germany; Geometroidea), Thomas Fartmann (Germany; ecology and conservation of butterflies and burnet moths), Zdeněk Faltynek Fric (Czech Republic; Papilionoidea), Axel Hausmann (Germany; Geometroidea and DNA barcoding), Peter Huemer (Austria; Alpine Lepidoptera and Gelechiidae, especially western Palaearctic), Lauri Kaila (Finland; non-butterfly taxonomy, systematics, and morphology), Bernard Landry (Switzerland; Pyraloidea, Alucitidae, and Pterophoridae), Carlos Lopez-Vaamonde (France; coevolution, DNA barcoding, Gracillaroidea, invasion biology, molecular phylogenetics, and phylogeography), Vazrick Nazari (Canada; DNA barcoding and phylogenetics), Erik J. van Nieukerken (the Netherlands; Nepticuloidea, Adeloidea (Incurvarioidea), leafminers in general, and DNA barcoding), László Ronkay (Hungary; Noctuoidea), Jadranka Rota (Denmark; morphology and systematics of basal Lepidoptera, Choreutidae, Cossoidea, Sesioidea, and other microlepidoptera), and Thomas Schmitt (Germany; butterfly ecology, biogeography, and population genetics). Paul Sokoloff will continue his work on *Nota* as an associate editor in charge of maintaining the high English language standards for all manuscripts in English. We hope this strategy of "divide and conquer" will lead to more timely processing of manuscripts and will further increase their scholarly standards.

At the same time, some of the long-time members of the editorial board resigned. After his long involvement with the journal, Roger Dennis has decided to retire from his formal association with *Nota*. Roger has been a member of the SEL since the founding of the society and has helped shape the journal over the past two decades serving various roles on the editorial board since 1995. I would like to thank Roger for his efforts over the years.

Together with the new editorial team, I will do my best to continue improving the journal and to maintain a dependable publication schedule. All of our future authors can help us by closely following the new directions for submission of manuscripts posted online on the SEL website. Thanks to a number of authors, we have many interesting submissions in this issue. I hope you enjoy reading from the following pages about the status of *Pyrgus cinarae* in the Iberian Peninsula, new species of *Eupithecia* from Syria and *Apatetris* from the Mediterranean, Bombycoidea and Noctuoidea of the Volgo-Ural region, butterflies of the Mongolian Altai, as well as Palaearctic *Cydia*.

Jadranka Rota

Natural history, immature stage morphology, and taxonomic status of the threatened skipper *Pyrgus cinarae* (Rambur, 1839) in the Iberian Peninsula (Lepidoptera: Hesperiidae)

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Abstract. New data on the ecology and natural history of the rare skipper *Pyrgus cinarae* (Rambur, 1839) in the Iberian Peninsula are presented and the habitats of its populations in Central Spain are described. *Filipendula vulgaris* Moench (Rosaceae) is the larval foodplant in the Serranía de Cuenca (Iberian Mountain System), while in the Sierra de Ávila (Central Mountain System) the larva feeds on *F. vulgaris* and *Potentilla recta* L. (Rosaceae). We report *Dolichogenidea sicarius* (Marshall, 1885) (Hymenoptera: Braconidae: Microgastrinae) as a larval parasitoid. Details of the egg, the last instar larva, and the pupa are shown in scanning electron micrographs. The egg has particularly high radial ribs, the last instar larva has setae with crowned or pointed tips and barrel-like cuticular formations, and the pupa has hairy mesothoracic tubercles. Differences with respect to immature stages of *Pyrgus cacaliae* (Rambur, 1839) are discussed; the types of larval head capsule setae and the shape of pupal mesothoracic tubercles are of special taxonomic value. In the light of morphological and genetic data we conclude that the recently discovered population from Sierra de Ávila can be ascribed to subspecies *clorinda* (Warren, 1927), due to genetic and morphological similarity to the Serranía de Cuenca populations. The main threats to its populations are overgrazing or the abandonment of agricultural practices. Finally, we discuss the conservation status of the species in the study area.

Resumen. Presentamos nuevos datos sobre la biología y la ecología del raro hespérido *Pyrgus cinarae* (Rambur, 1839) en la Península Ibérica y describimos los hábitats de sus poblaciones en el centro de España. *Filipendula vulgaris* Moench (Rosaceae) es la planta huésped en las poblaciones de la Serranía de Cuenca (Sistema ibérico) y en la Sierra de Ávila (Sistema Central) utiliza *F. vulgaris* y *Potentilla recta* L. (Rosaceae). Las larvas son atacadas por el parasitoide *Dolichogenidea sicarius* (Marshall, 1885) (Hymenoptera: Braconidae: Microgastrinae). Mostramos y describimos los detalles morfológicos del huevo, la larva de última edad y la pupa, obtenidos con microscopio electrónico de barrido. El huevo tiene costillas radiales particularmente altas, la larva de última edad tiene sedas con extremos coronados o puntiagudos y formaciones cuticulares en forma de tonel, y la pupa tiene tubérculos mesotorácicos peludos. Se discuten las diferencias con los estados inmaduros de *Pyrgus cacaliae* (Rambur, 1839); los tipos de sedas de la cápsula cefálica de las larvas y la forma de los tubérculos mesotorácicos de las pupas son de especial valor taxonómico. Concluimos que la población recientemente descubierta en la Sierra de Ávila puede adscribirse a la subespecie *clorinda* (Warren, 1927), debido a la similitud morfológica y genética con las poblaciones de la Serranía de Cuenca. Las principales amenazas de estas poblaciones son el sobrepastoreo o el abandono de las prácticas agrícolas. Finalmente, discutimos el estatus de conservación de la especie en la zona de estudio.

Introduction

The distribution of *Pyrgus cinarae* (Rambur, 1839) reaches into Central Asia but in Europe is limited to the Iberian and Balkan Peninsulas showing a clearly disjunct pattern (Hernández-Roldán et al. 2011a). In the Iberian Peninsula it is found in small and

isolated populations and is considered one of the rarest butterflies (Hernández-Roldán & Vicente 2010). The extremely localized Iberian populations are found in Central Spain, more precisely in the Iberian Mountain System (Serranía de Cuenca and Sierra de Albarracín) (Chapman 1901; Querci 1932; Gómez-Bustillo & Fernández-Rubio 1974; Fernández-Rubio 1981; Redondo 1990; Arce et al. 2006; Hernández-Roldán & Vicente 2010), where subspecies *clorinda* (Warren, 1927) was described, and in the Central Mountain System (Sierra de Ávila) where it has recently been discovered (Hernández-Roldán & Vicente 2010; Vicente & Parra 2010). The latter population is separated by *ca.* 300 km from the nearest populations in the Iberian Mountain System.

Given the geographical position, it is also doubtful whether the new populations could be assigned to subspecies *clorinda* or they represent a new subspecies. The Iberian populations are separated by *ca.* 1800 km from their nearest conspecifics living in the Balkan Peninsula (Greece, Macedonia, and Bulgaria). The species is also recorded from Ukraine, Turkey, Armenia, and from southern Russia to Turkistan (Tolman & Lewington 1997; Gorbunov 2001; Kudrna 2002; Gorbunov & Kosterin 2003). The Iberian *P. cinarae* have been found to be sister populations to those existing outside of Iberia, from which they are genetically well diverged (2.6%, Hernández-Roldán et al. 2011a). They appear to have been isolated for around one million years, being considered by Hernández-Roldán et al. (2011a) an independent evolutionary lineage.

The species' life history has been recently described and immature stages figured by Wagner (2009), using material from Greece. The larva feeds on *Potentilla recta* (Wagner 2009) or *P. hirta* (Wagner pers. com.) and females lay their eggs on the fruits. Winter is spent as a first instar larva inside the egg and emergence takes place during the following March. The larva feeds on the leaves until full size is reached and pupation takes place at the end of May, with the pupal stage lasting for around three weeks. A detailed morphological study of the eggs, larvae and pupae has not been previously undertaken for this species.

At European level, the conservation status of *Pyrgus cinarae* has been considered as *least concern* (LC) following IUCN criteria (Van Sway et al. 2010). In Spain, as there are relatively few populations, the species has been considered *vulnerable* (Hernández-Roldán et al. 2011c) using criteria B1ac(iii) (IUCN 2001). The populations from Castilla-La Mancha Region (Serranía de Cuenca) have been listed under the category "interés especial" (*special interest*, DOCM 2006). Moreover, most of the populations in the Iberian Mountain System live within the Serranía de Cuenca Natural Park and are therefore legally protected.

The objective of the present paper is to describe the life cycle and the morphological details of the egg, last instar larva and pupa of *Pyrgus cinarae* in the Iberian Peninsula. The morphological study is based on scanning electron micrographs. We also discuss the taxonomic status of the new populations found in the Central Mountain System and evaluate the threats and conservation status of the species in the study area.

Abbreviations

MNCN: Natural History Museum, Madrid, Spain
J. L. H.-R.: Personal collection of Juan L. Hernández-Roldán

Material and Methods

Sample collecting and rearing experiments

Three populations were studied in Central Spain during the years 2010 and 2011, two of them located in Serranía de Cuenca (Huélamo and Carrascosa, Iberian Mountain System) and one in Sierra de Ávila (Central Mountain System). Eggs were collected by following females in the field until oviposition took place and then searching for them on the plant. Larvae were collected on the foodplants. Rearing was done from field-collected eggs and larvae, under laboratory conditions, with the weather parameters different from the natural habitat (higher temperature and lower altitude and relative humidity). Larvae were fed using the same species of plants on which they were collected. The adults used in this study were reared from eggs or larvae or were studied in the collections of the authors or in the Museo Nacional de Ciencias Naturales (Natural History Museum, Madrid, Spain – MNCN).

Scanning electron micrographs

Images used to study the morphology of the egg, last instar larvae, and pupae were obtained using a Hitachi S-3000N scanning electron microscope, with an acceleration voltage of 20 kV. Dried samples were used in the case of the egg and pupa. The eggs were killed with ethyl acetate when the larva was already formed inside the egg to prevent the collapsing of the egg when dried. For the study of pupae, exuviae were used after the adult emergence. Larvae were preserved in 70% ethanol and then fixed with 1.5% formaldehyde. For larval dehydration a series of increasing concentrations of ethanol was used up to absolute ethanol, ending with critical-point drying using Emitech K850. Samples were then coated with a 10 nm layer of gold using an Au-Cr Quorum 150TS sputter. The microscope and the rest of the used equipment are located in the Servicio Interdepartamental de Investigación (SIDI) of the Universidad Autónoma de Madrid. A scale bar was added to all obtained images. Egg measurements were performed directly on the images using ImageJ.1.43 software (Ferreira & Rasband 2010).

Results

Studied Material

Pyrgus cinarae clorinda (Warren, 1927)

Material. **Spain**: Syntype ♀, Valdecabras, Serranía de Cuenca (Cuenca), 1200 m, 25.vii.1926, leg. O. Querci & C. Querci (MNCN); Syntype ♂, Huélamo, Serranía de Cuenca (Cuenca), 1200 m, 28.vii.1926, leg. O. Querci & C. Querci (MNCN); ♂, Huélamo, Serranía de Cuenca (Cuenca), 1200 m, 28.vii.1926, leg. O. Querci & C. Querci (MNCN); ♂, Serranía de Cuenca (Cuenca), 1200 m, 22.vii.1933 leg. O. Querci & C. Querci (MNCN); ♀, Huélamo, Serranía de Cuenca (Cuenca), 1237 m, 29.vii.2007, leg. et coll. J. L. H.-R.; ♀, Carrascosa, Serranía de Cuenca (Cuenca), 1300 m, 28.vii.2009, leg. et coll. J. L. H.-R.; ♂, Carrascosa, Serranía de Cuenca (Cuenca), 1300 m, 24.vii.2010, leg. et coll. J. L. H.-R.; 2 ♂, Sierra de Ávila (Ávila), 1350 m, 31.vii.2010, leg. et coll. J. L. H.-R.; 2 ♀, Sierra de Ávila (Ávila), 1350 m, 2.viii.2010, 10.viii.2010, leg. J. L. H.-R. & J. C. Vicente (J. L. H.-R.); ca. 20 eggs on *Potentilla recta*

Figs 1–5. Habitats and foodplants of *Pyrgus cinarae clorinda* in the Iberian Peninsula. **1.** Habitat in Huélamo, Serranía de Cuenca (Spain, August 2011). **2.** Habitat in Sierra de Ávila (Spain, August 2011). **3.** Flowerhead of *Filipendula vulgaris* (June 2011). **4.** *F. vulgaris* in the flowering season (June 2011). **5.** *Potentilla recta* in flower (June 2011).

and *Filipendula vulgaris*, Sierra de Ávila (Ávila), 1350 m, 10.viii.2010, 16.x.2010, 26.ii.2011, em. ♂, 20.vi.2011, ♀, 15.vi.2011, leg. J. L. H.-R. & J. C. V. (J. L. H.-R.); 10 larvae on *P. recta* and *F. vulgaris*, Sierra de Ávila (Ávila), 1350 m, 4.vi.2011, em. 2 ♂, 3.vii.2011, 4.vii.2011, 2 ♀, 4.vii.2011, 8.vii.2011, leg. J. L. H.-R. & J. C. V. (J. L. H.-R.); 2 eggs on *F. vulgaris*, Carrascosa, Serranía de Cuenca (Cuenca), 1300 m, 22.vii.2011, leg. J. L. H.-R.; 1 egg on *F. vulgaris*, Huélamo, Serranía de Cuenca (Cuenca), 1237 m, 13.viii.2011, leg. J. L. H.-R.

Pyrgus cinarae cinarae (Rambur, 1839)

Material. **Armenia**: ♂, 150 km SE Yerevan, Yaghegnadzor suburbs (Aiotzdzorsky range), 1800 m, 26.vii.2007, leg. Y. Shevnin (J. L. H.-R.); ♀, 10 km to E from Yerevan, Voghdjaberd village, 1500 m, 23.vii.2009, leg. V. Hambartzumian (J. L. H.-R.).

Dolichogenidea sicarius (Marshall, 1885) (Hymenoptera: Braconidae: Microgastrinae)

Material. **Spain**: 2 ♂, Sierra de Ávila, 1350 m, *ex P. cinarae clorinda* 4.vi.2011, em. 16.vi.2011, 22.vi. 2011, leg. J. L. H.-R. & J. C. V., det. M. Shaw (J. L. H.-R.)

Habitats and natural history in the Iberian Peninsula

Habitats of *P. cinarae* in the Iberian Peninsula are located at altitudes ranging from 1100 to 1500 m and consist of xeromesophilous grasslands with extensive livestock management, in the supramediterranean bioclimatic stage (Figs 1, 2). The populations in the Serranía de Cuenca (Iberian Mountain System) belong to the Central Iberian Mediterranean botanical biogeographical region and the population from the Sierra de Ávila to the Occidental Iberian Mediterranean region (Rivas Martínez 1987). The populations in the Serranía de Cuenca are found in the calcicole Portuguese oak (Quejigo) forest vegetation communities: Huélamo in the phytosociological association *Violo willkommii-Quercetum fagineae* (Braun-Blanquet & Bolós 1950) and Carrascosa in the association *Cephalanthero longifoliae-Quercetum fagineae* (Rivas Goday 1959). The population in the Sierra de Ávila lives in silicicole Pyrenean oak (Melojo) forests, in the association *Luzulo forsteri-Quercetum pyrenaicae* (Rivas Martinez 1962).

The foodplant in the Serranía de Cuenca is *Filipendula vulgaris* Moench (Rosaceae) (Figs 3, 4) in the two studied localities and in the Sierra de Ávila the species uses *F. vulgaris* and *Potentilla recta* L. (Rosaceae) (Fig. 5). Females lay their eggs one by one on the dried fruits of *P. recta* (heads of achenes) or *F. vulgaris* (polyachenes) (Figs 6, 7). After four or five days the larvae are already developed but remain inside the eggshell, where they overwinter. In the following spring they hatch during the months of March and April (Fig. 8). Larvae feed on the leaves of their foodplants (Fig. 9) and build shelters to protect themselves against predators and parasitoids (Figs 10, 11). These shelters are built by joining leaves of the plant with silk threads produced by the larval silk glands. The third instar larvae are attacked in the Sierra de Ávila by the solitary endoparasitoid *Dolichogenidea sicarius* (Marshall, 1885) (Hymenoptera: Braconidae: Microgastrinae) (Figs 12, 13). At the end of June or in July larvae reach their maximum development and pupate inside a shelter made with leaves of the plant or near it (Figs 14, 15). The pupal phase (Figs 16, 17) lasts for around three weeks, after which the adults emerge during July and August (Figs 18–21).

Immature stage morphology

Egg (Figs 6, 7, 22–29)

The egg is whitish after being laid and subsequently turns to a pale orange colour in one or two days. Its form is spherical with hollows in the base and annular areas. The diameter is 0.86±0.03 mm (n=5) and its height 0.64±0.02 mm (n=4). The chorion surface is perforated by pores (Figs 24, 25) and the egg is covered by radial and transversal ribs that form cells, usually of rectangular shape (Figs 24, 25). When the radial ribs meet in the annular area the cells have a pentagonal form (Fig. 23). Aeropyles (respiratory openings of the egg) are found in the junctions of radial and transverse ribs (Figs 24, 25). In the equator of the egg the number of radial ribs is 22–24 (n=5, Fig. 26). The radial ribs are much higher (32±2 µm, n=5) than the transverse ribs (Fig. 24). In the annular area of the egg, the micropylar rosette has seven to nine (n=5) polygonal petaloid cells (Fig. 28). Surrounding the micropylar rosette there are three to four series of cells, so that the total number of cells in this area is 49 to 53 (n=5, Fig. 27). The micropylar depression is pentagonal and three to five (n=5) micropylar openings are found in the angles (Fig. 29), although the most usual number is five.

Last instar larva (Figs 14, 15, 30–37)

The surface of the head capsule displays a reticular pattern and is covered by a large number of thin setae of different lengths, with smooth surface and a toothed crown on their tip (Fig. 31). The collar is placed after the head capsule (Fig. 30) and has a smooth cuticle and setae of different lengths. In the rest of the body segments the cuticle is armoured by star shaped formations (Fig. 34). The first thoracic segment has one trichobotrium on each side (Fig. 33). Each segment of the thorax, the abdomen and the collar has a couple of special barrel-like cuticular formations (Fig. 35). These formations were first described by Hernández-Roldán et al. (2011b) in *Pyrgus*

Figs 6–13. Life cycle of *Pyrgus cinarae clorinda* in the Sierra de Ávila (Spain). **6.** Egg on a *Potentilla recta* head of achenes in August 2010. **7.** Egg on a *Filipendula vulgaris* polyachene in August 2010. **8.** Recently emerged first instar larva on a fruit head of *P. recta* (note the chorion remains of the egg) (March 2011). **9.** Third instar larva feeding on *F. vulgaris*. **10., 11.** Shelter of a larva made with the leaves of *P. recta* and *F. vulgaris*, respectively. **12.** Cocoon of the parasitoid *Dolichogenidea sicarius* (Hymenoptera), with the remains of a third instar larva of *Pyrgus cinarae* on *Potentilla recta*. **13.** Adult of *Dolichogenidea sicarius* reared from *Pyrgus cinarae clorinda* (Figs 9–13 taken in June 2011).

cacaliae (Rambur, 1839). In addition, the dorsal and subdorsal areas of each segment bear thin and short setae with a crowned tip and a lower number of long and thin setae with pointed tips. The setae of the latter type are more abundant in the subdorsal area (Fig. 33). Both crowned and pointed setae have a rounded base. Spiracles are placed between the subdorsal and lateral zones on the third thoracic and on the abdominal segments (Fig. 36). The inner part of the spiracles has prominent papillae with spiny branches. The anal plate (Fig. 37), which is placed on the last abdominal segment, is smoother than the rest of the cuticle and has a large number of crown-tipped setae of different lengths.

Pupa (Figs 16, 17, 38–45)

The pupa is bullet shaped, with a smooth cuticle of dark grey or black colour. It is externally covered by wax giving the pupa a characteristic pruinose appearance and a light grey colour (Figs 16, 17). It has mesothoracic tubercles on each side of the anterior border of the mesothorax (Fig. 38). The external wall of the tubercles is undulated (Fig. 39) and the tubercle itself has a dense cover of hairs (Figs 39, 40). The pretubercular chamber has short hairs in the area that is close to the tubercle and spines in the area that is far from it (Fig. 40). The pupal cuticle has scattered long setae with a rounded base that are denser on the dorsal and lateral areas of the abdomen (Figs 38, 43). On each segment of the subdorsal zone of the abdomen there are spiracles (Fig. 41) that are filled with spiny-branched papillae (Fig. 42). The last abdominal segment bears the cremaster (Figs 43, 44), which is formed by around 30 setae with coiled helicoid tips. These setae keep the pupae fixed to the substrate by means of the silken threads spinned by the larvae (Fig. 45).

Adult external morphology

Males from the recently discovered population in the Sierra de Ávila (Figs 46–49) have a shiny yellow ochre colour and veins clearly visible and lined in pale yellow on the hindwing underside. The males from the Serranía de Cuenca display the same pattern (Figs 50–53). Females from the Sierra de Ávila (Figs 54–56) are similar, as far as these characters are concerned, to those from the Serranía de Cuenca (Figs 57–59). Nevertheless, females show a greater variability than males in both populations. Subspecies *clorinda* could be separated from oriental samples belonging to the nominal subspecies (Figs 60, 61) mainly because in the latter the hindwing underside shows a "very dull ochre" colour (Warren 1927).

Discussion

Habitat and natural history

The life cycle of *Pyrgus cinarae* is similar in the Iberian Peninsula and Greece (Wagner 2009). It shows specific and infrequent ecological adaptations: it is the only European

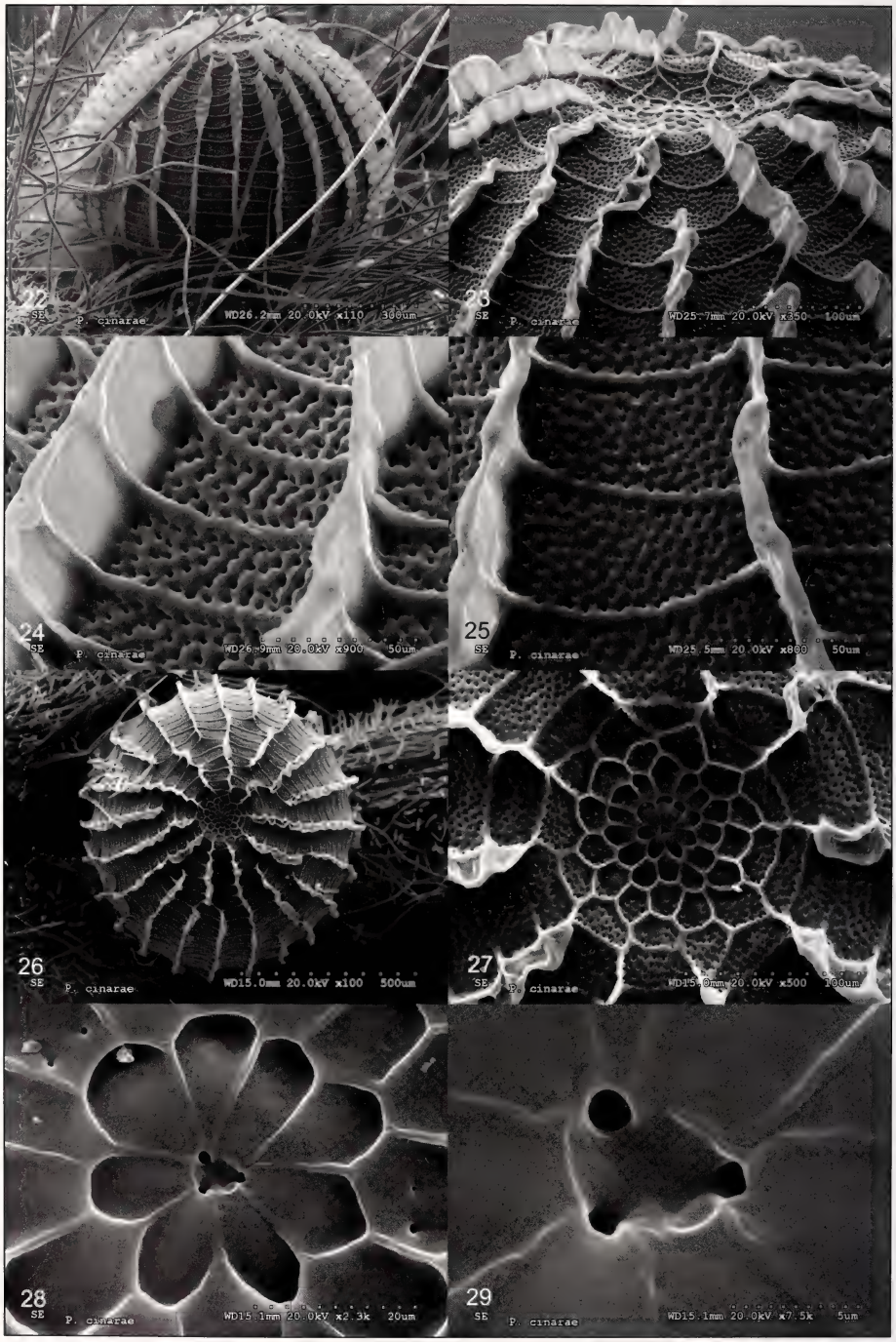
Figs 14–21. *Pyrgus cinarae clorinda:* life cycle in Sierra de Ávila (Spain). **14.** Dorsal view of the last instar larva on *Potentilla recta* (June 2011). **15.** Lateral view of last instar larva on *Filipendula vulgaris* (June 2011). **16., 17.** Dorsal and lateral views of the pupa on *P. recta* (July 2011). **18., 19.** Dorsal views of adult male and female in August 2010. **20., 21.** Lateral view of adult male and female in August 2010.

Pyrgus whose females lay eggs on the fruits and one of only three species, together with *P. carlinae* (Rambur, 1839) and *P. cirsii* (Rambur, 1839), that overwinter as a larva inside the eggshell. The similar life history traits of Iberian and oriental populations support the hypothesis that, although they have been isolated for around a million years (Hernández-Roldán et al. 2011a), no evidence for the establishment of potential barriers to gene flow (other than geographic) exist that could indicate speciation according to the biological species concept.

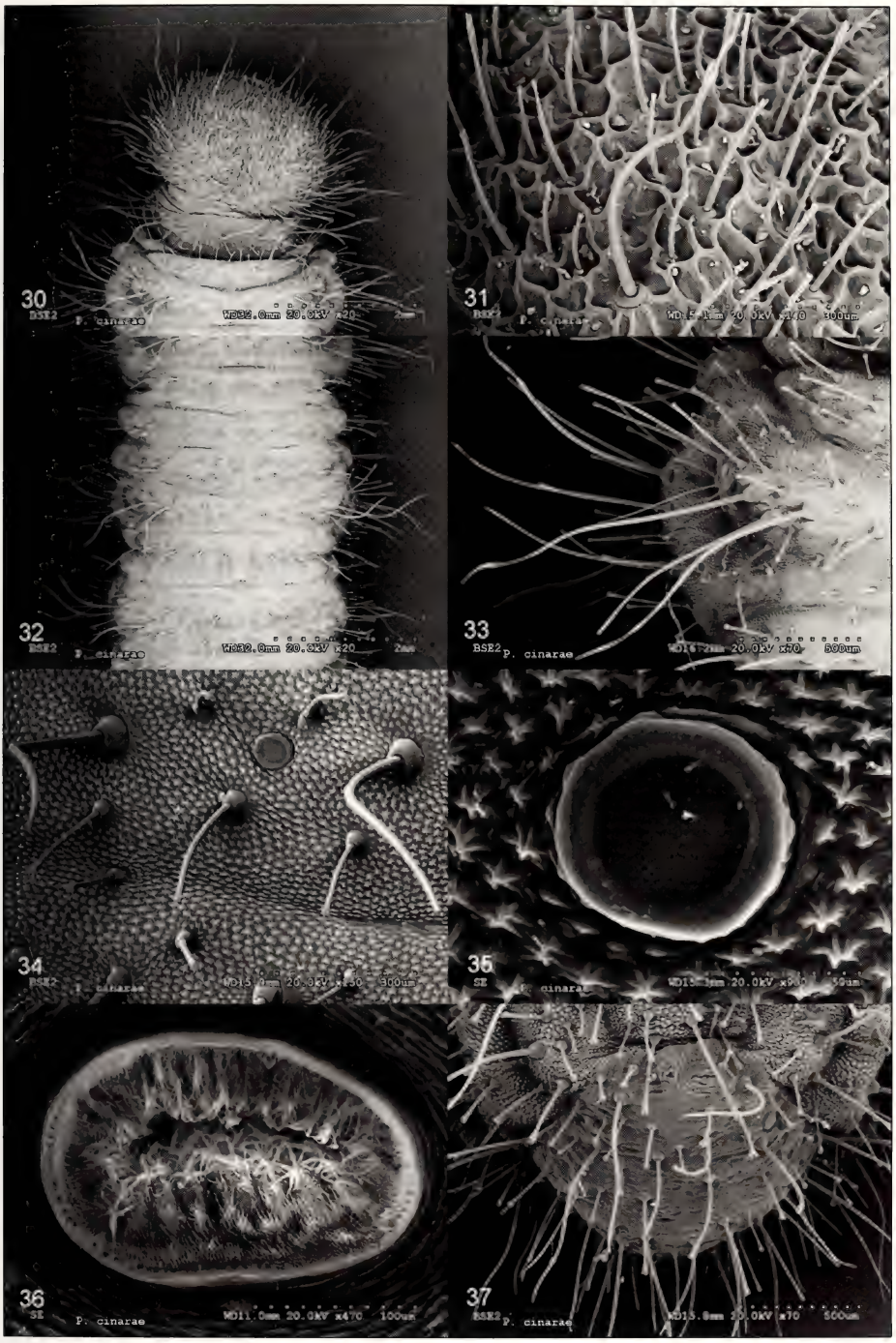
In Greece, the habitat of the species consists of grasslands that are extensively grazed by sheep and goats. Here the species could be possibly threatened by overgrazing or by the abandonment of extensive grazing (Wagner 2009). The Iberian populations are extremely localized and seem to occupy a narrower ecological niche than the oriental populations (Hernández-Roldán et al. 2011a). In the Serranía de Cuenca the grasslands with *Filipendula vulgaris* that could be favourable for the species are rare (López 1978). This fact, together with the false idea that the habitat for the species consisted of "extremely arid areas, devoid of vegetation" and that the larval foodplants were "herbaceous Poaceae" (Gómez-Bustillo & Fernández-Rubio 1974; Viedma & Gómez-Bustillo 1985), could have been the cause of the few records of the species. This contrasts with the fact that, at the beginning of the 20th century, Orazio Querci and his wife were able to collect almost a hundred individuals in the area (Warren 1927; Querci 1932). It is therefore possible that new sampling performed on the basis of our recent knowledge of life history traits, together with the information provided by ecological niche modelling based on environmental variables (Romo et al. 2006; Hernández-Roldán et al. 2011a), could lead to the discovery of new populations that will improve our knowledge of the species distribution.

Taxonomic value of immature stage morphology

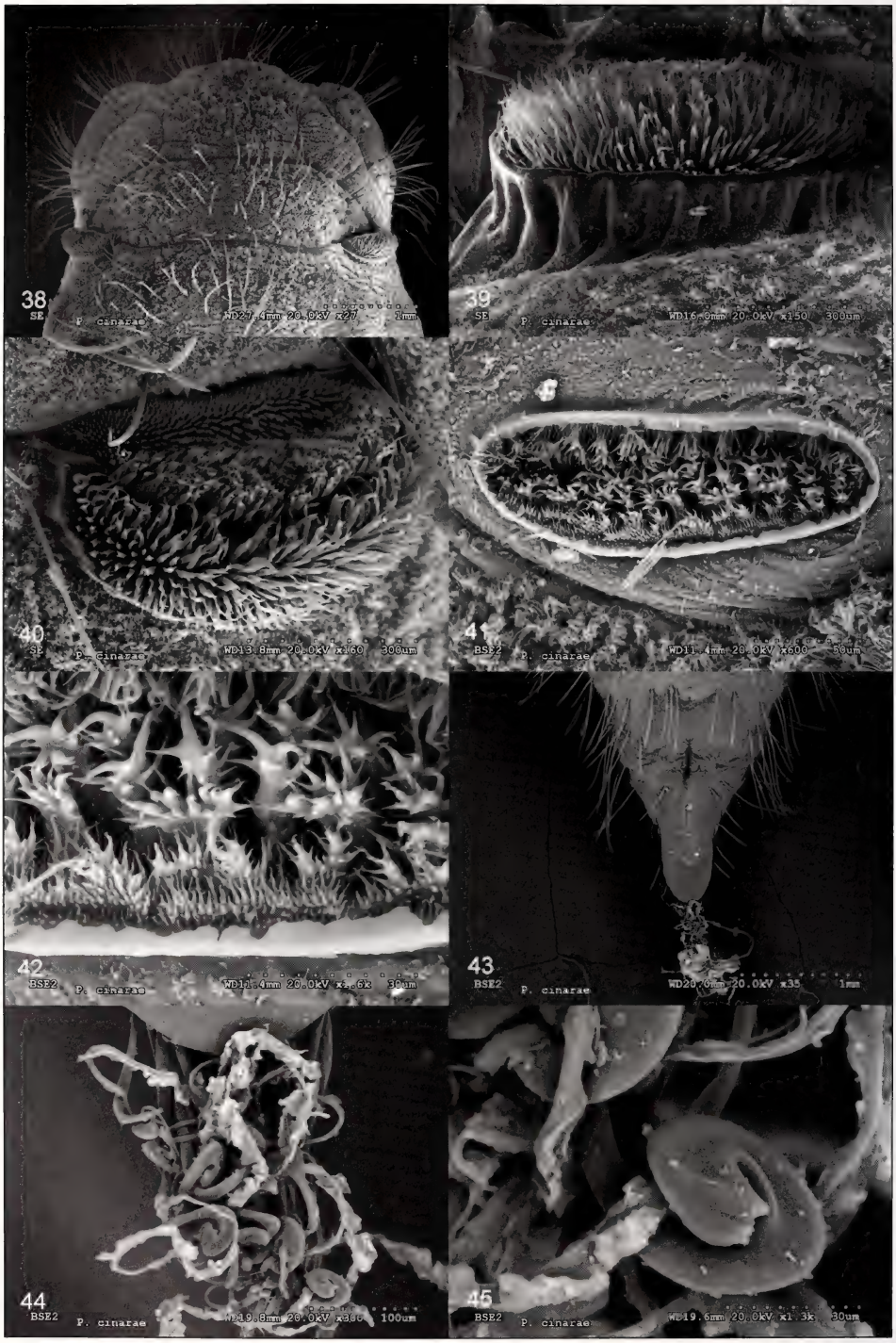
When comparing the morphological characters of the immature stages of *P. cinarae* (see results) with those of *P. cacaliae* described by Hernández-Roldán et al. (2011b), we have detected some differences. The eggs of *P. cinarae* are larger than those of *P. cacaliae* (0.86 mm vs. 0.79 mm) and the radial ribs taller (32 µm vs. 4 µm). Moreover, the cells in the micropylar area have lower numbers in this species (49–53) when compared with *P. cacaliae* (59–62). Larvae of *P. cinarae* have crown-tipped setae on the head capsule and branched spiracular papillae, while in *P. cacaliae* the setae on the head capsule have pointed tips and the spiracular papillae are not branched. Pupal differences consist of the undulated external wall and the hairy surface of the mesothoracic tubercles, pretubercular chamber with hairs and spines and spiracles with branched papillae in *P. cinarae;* in *P. cacaliae* the mesothoracic tubercles have smooth walls and lack hairs, the pretubercular chamber has only spines and the spiracles have unbranched papillae. It is therefore evident that the immature stages of *P. cinarae* have different characters to those of *P. cacaliae* described in Hernández-Roldán et al. (2011b). This fact supports the use of traits of the egg, larva and pupa for taxonomical purposes and opens the possibility of using them as tools to infer phylogenetic relationships in the genus *Pyrgus*.



Figs 22–29. Scanning electron micrographs of the egg of *Pyrgus cinarae clorinda* (Sierra de Ávila, Spain). **22.** Lateral view. **23.** Lateral view of the annular area with micropylar rosette in the middle. **24.** Detail of the radial ribs. **25.** Cells of the egg equator formed by radial and transversal ribs. **26.** View of the annular pole. **27.** Annular area with the micropylar rosette. **28., 29.** Micropylar rosette and micropyle showing the micropylar openings.



Figs 30–37. Scanning electron micrographs of the last instar larva of *Pyrgus cinarae clorinda* (Sierra de Ávila, Spain). **30**. Head capsule and collar. **31.** Detail of the head capsule setae and sculpture. **32.** Cuticular formations on thoracic and abdominal segments. **33.** Detail with different types of subdorsal and lateral setae on the first thoracic segment: large pointed-tip setae, short setae with crowned tips and a trichobotrium. **34.** Cuticular formations on an abdominal segment. **35.** Detail of a barrel-like formation and the cuticular sculpture. **36.** Last abdominal spiracle. **37.** Last abdominal segments with the anal plate and setae with pointed and crowned tips, both with rounded bases.



Figs 38–45. Scanning electron micrographs of the pupa of *Pyrgus cinarae clorinda* (Sierra de Ávila, Spain). **38.** Head and mesothorax with mesothoracic tubercles and long setae. **39.** Lateral view of the mesothoracic tubercle. **40.** Frontal view of the mesothoracic tubercle. **41.** Abdominal spiracle. **42.** Detail of the papillae inside the spiracle. **43.** Ventral view of the last abdominal segments. **44.** Detail of the cremaster and **45.** the tips of cremaster setae.

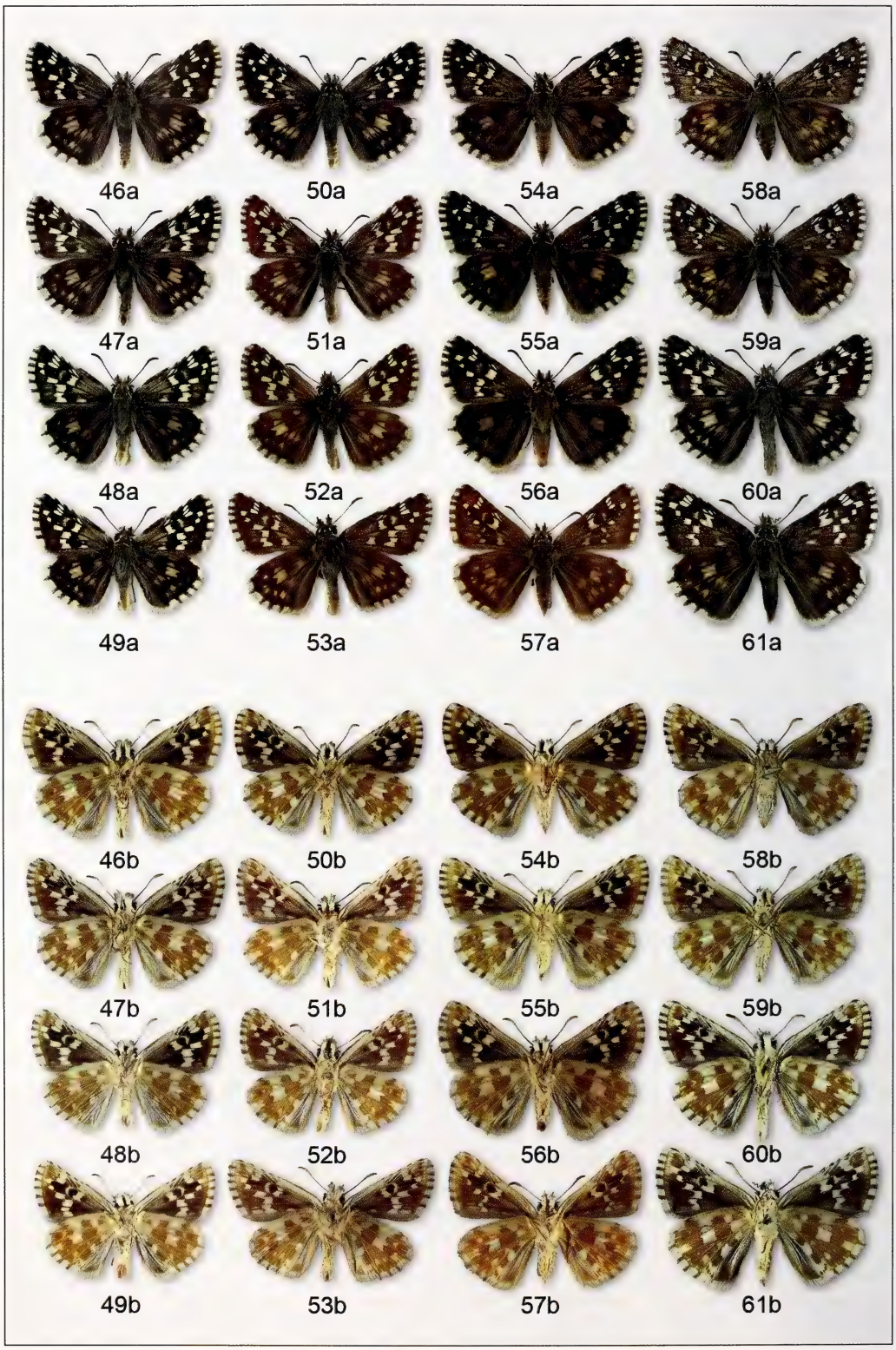
Taxonomic status of the new population in Ávila

The subspecies *clorinda* was described based on specimens collected in the Serranía de Cuenca. Warren (1927) pointed out differences in the external morphology of the adult: "The characteristics which distinguish this race from the type (eastern form) are: the bright yellow ground colour of the underside of the hindwings (invariably a very dull ochre in eastern European, or Asiatic specimens) and the clearly visible nervures of the same, outlined in a light yellow and in consequence contrasting sharply with the ground colour. The bright shade of the ground colour also suffuses the costa and apex of the forewings underside. On the upperside the light marking of the hindwings are slightly buff, or cream in the male, and of a deep, almost ochre shade in the female." As has been stated above, specimens from Ávila and Cuenca are indistinguishable regarding the adult external morphology. This is also true as far as the morphology of the male genitalia is concerned (Fernández-Rubio 1981; Hernández-Roldán & Vicente 2010). Moreover, the specimens from the Sierra de Ávila and Serranía de Cuenca have identical mitochondrial DNA haplotypes (cytochrome c oxidase subunit I, COI). This contrasts with the high divergence (2.6%) found between the Iberian and oriental populations detected for the same gene (Hernández-Roldán et al. 2011a). In conclusion, since the populations in Ávila and Cuenca are genetically and morphologically similar, the recently discovered population in Sierra de Ávila should be considered as belonging to subspecies *clorinda* (Warren, 1927).

Conservation

Detected threats to the populations of *P. cinarae* in the Iberian Peninsula include habitat destruction, habitat quality loss, agriculture, and overgrazing, as well as afforestation (Hernández-Roldán & Vicente 2010; Hernández-Roldán et al. 2011c). In the Cuenca area, there is a threat of overgrazing by horses in the population of Huélamo, and this is probably the reason why this population has very low numbers of individuals. Grazing by sheep takes place in the habitat of the Carrascosa population. The habitat in the Sierra de Ávila is managed by extensive grazing and is used as hay meadow area. These practices could pose a serious threat for the future survival of the species if management is intensified. Regarding intrinsic threatening factors, the Iberian populations of *P. cinarae* have been historically on the brink of extinction due to a genetic bottleneck that caused a drastic decline in population numbers, followed by a later expansion. This has resulted in an extremely low genetic variability (Hernández-Roldán et al. 2011a) that, coupled with the remarkably restricted range and a very narrow ecological niche of its populations, suggests that this subspecies is prone to extinction. Even if *clorinda* does not represent a different species, the unique genetic pool that it represents makes protection efforts for this taxon advisable.

The species has been considered under the category "vulnerable" in the Spanish Red List of Invertebrates (Hernández-Roldán et al. 2011c), based on geographical criteria (B criteria, IUCN 2001). In this case it was not possible to rely on population abundance or trends to analyse the species' status (criteria A, C, D or E, IUCN 2001),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because these data were not available in the study area. We therefore recommend carrying out population studies like those performed for other rare Iberian skippers (Hernández-Roldán et al. 2009). Such studies would provide a more accurate evaluation of the status of this species and allow sound recommendations for conservation management.

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Figs 46–61, a. Dorsal view, **b.** Ventral view. *Pyrgus cinarae clorinda* (Figs 46–59) and *Pyrgus cinarae cinarae* (Figs 60, 61). **46–49.** Males from Sierra de Ávila, Spain, 1350 m, 31.vii.2010 (46 and 47), *ex larva* 4.vi.2011 (48 and 49). **50.** Male from Carrascosa, Serranía de Cuenca, Spain, 1300 m, 24.vii.2010. **51–52.** Males from Huélamo, Serranía de Cuenca, Spain, 1200 m, 28.vii.1926. **53.** Male from Serranía de Cuenca, Spain, 1200 m, 22.vii.1933. **54–56.** Females from Sierra de Ávila, Spain, 1350 m, 2.viii.2010, 10.viii.2010, *ex ovo* 26.ii.2011. **57.** Female from Valdecabras, Serranía de Cuenca, Spain, 1200 m, 25.vii.1926. **58.** Female from Huélamo, Serranía de Cuenca, Spain, 1237 m, 29.vii.2007. **59.** Female from Carrascosa, Serranía de Cuenca, Spain, 1300 m, 28.vii.2009. **60.** Male from Aiotzdzorsky range, Armenia, 1800 m, 26.vii.2007. **61.** Female from Voghdjaberd village, Armenia, 1500 m, 23.vii.2009. Specimens in Figs 51 and 57 are syntypes. All specimens are shown at real scale.

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New species of *Eupithecia* Curtis (Geometridae: Larentiinae) from Syria

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Abstract. One new species of *Eupithecia* from the "*venosata*" group is described from Syria: *E. weigti* sp. n. Five other species of the genus are mentioned as new to the Syrian fauna: *E. achyrdaghica* Wehrli, 1929, *E. ericeata* (Rambur, 1833), *E. reisserata* Pinker, 1976, *E. scalptata* Christoph, 1885, and *E. variostrigata* Alphéraky, 1876.

Introduction

The "*venosata*" species-group was first suggested by Dietze (1913) in his classic folio "Biologie der Eupithecien". He had included six allied Palaearctic species in this group: *E. carpophagata* Staudinger, 1871, *E. venosata* (Fabricius, 1787), *E. schiefereri* Bohatsch, 1893, *E. hilariata* Dietze, 1908, *E. silenicolata* Mabille, 1867, and *E. alliaria* Staudinger, 1870. However, this species-group was later revised in detail by Schütze (1960). He described this group as subgenus *Bohatschia* Schütze and included within it 14 species of *Eupithecia*.

The "*venosata*" group is one of the most species rich in the genus *Eupithecia*, especially in the Mid-East, Transcaucasus and Irano-Afghanian Region of the Old World. This group is represented in this large area by at least the following 16 species: *E. venosata* (Fabricius, 1787), *E. silenicolata* Mabille, 1867, *E. alliaria* Staudinger, 1870, *E. demetata* Christoph, 1885, *E. stigmaticata* Christoph, 1885, *E. amasina* Bohatsch, 1893, *E. schiefereri* Bohatsch, 1893, *E. ponderata* Dietze, 1906, *E. achyrdaghica* Wehrli, 1929, *E. cheituna* Brandt, 1938, *E. montanata* Brandt, 1938, *E. sectila* Brandt, 1938, *E. pfeifferata* Schütze, 1960, *E. problematicata* Schütze, 1960, *E. christophi* Mironov, 1988, and *E. pinkeri* Mironov, 1991. We found one very interesting specimen of this group in the collection of the Hungarian Natural History Museum (Budapest, Hungary), which is described here as a new species.

The fauna of the geometrid moths of the modern territory of Syria is still not well documented. Some species of *Eupithecia* were described from the former territory of Syria: Beirut, Akbés, Achyr-Dagh. Currently these localities are in Lebanon and Turkey. Only six species of *Eupithecia* were mentioned by Wiltshire (1936) and Mironov (2003) for Syria: *E. laquaearia* Herrich-Schäffer, 1848, *E. minusculata* Alphéraky, 1882, *E. dubiosa* Dietze, 1910, *E. quercetica* Prout, 1938, *E. centaureata* (Denis & Schiffermüller, 1775), and *E. gratiosata* Herrich-Schäffer, 1861. We add to this list five species which are new to the fauna of Syria.

Abbreviations

MNHU	Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany
NHMW	Naturhistorisches Museum Wien, Austria
SMNK	Staatliches Museum für Naturkunde Karlsruhe, Germany
TTM	Termeszettudomanyi Muzeum Allattara (Hungarian Natural History Museum), Budapest, Hungary
ZFMK	Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany
ZISP	Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia
ZSM	Zoologische Staatssammlung München, Germany

Eupithecia weigti Mironov & Ratzel, sp. n.

Material. Holotype ♀, Syria, 25 km W v. Damaskus, 2–3.vi.1961, Kasy & Vartian leg., Ratzel slide no. 12609/5w (coll. Vartian in NHMW). The specimen was loaned in former times by A. Vojnits from coll. Vartian and placed in TTM till now and will be returned in future to NHMW.

Description (Fig. 1). Wingspan 16.5 mm; forewing 8.5 mm. Labial palpi equal to the diameter of eye, covered with mixed brown and ash grey scales. Frons, vertex, and notum with mixture of light brown and dominating ash grey scales. Forewing rather elongated and narrow with narrowly rounded apex; ground colour ash grey; transverse lines very distinct, narrow, blackish brown; basal line evenly curved; antemedial almost straight, broadened anteriorly and indented in posterior half; medial line double, touching discal dot and sharply curved onto costa; postmedial line wavy, right-angled and broadened onto costa, with narrow, inward angle on CuA_2 vein; terminal area narrow without light subterminal line; discal dot relatively large, elongated and narrow, oblique, black. Hindwing slightly ovoid, paler, whitish grey; basal, ante- and postmedial transverse lines distinct; postmedial line right angled onto costa, with elongated, dark innerward dash on CuA vein; terminal area narrow, without light subterminal line; discal dot relatively large, paler than on the forewing; narrow and elongate. Fringe distinctly chequered with grey and white on all wings.

Male unknown.

Female genitalia (Fig. 5). Bursa copulatrix small, ovoid, almost completely and densely covered with very small, unisized spines except small area near base of ductus seminalis and colliculum, with two short and broad membranous diverticula (one under base of ductus seminalis, the other in anterior part of corpus bursae on other side). Ductus seminalis short, slightly broadened basally, attached to ductus bursae at right side near base of colliculum. Colliculum collar-like, relatively short and narrow. Antrum short, broad, membranous. Tergite A8 rectangular. Anterior and posterior apophyses short and narrow. Papillae anales relatively short and broad, covered with short setae.

Distribution. Syria.

Diagnosis. *Eupithecia weigti* sp. n. resembles externally *E. achyrdaghica* Wehrli, 1929 (Fig. 2); however, on the forewing the antemedial transverse line is placed on the shorter distance from the double medial line, which is later more wavy; also, discal dots on all wings are larger and broader than in *E. achyrdaghica*. The female genitalia are very

Figs 1–4. Adults of *Eupithecia* spp. (scale bar = 10 mm). **1.** *E. weigti* Mironov & Ratzel, sp. n. (holotype, ♀). **2.** *E. achyrdaghica* Wehrli, 1929 (Syria, ♀). **3.** *E. ericeata* (Rambur, 1833) (Syria, ♂). **4.** *E. variostrigata* Alphéraky, 1876 (Syria, ♂).

similar to those of *E. achyrdaghica* (Fig. 6), but the latter has a smaller membranous diverticulum which is attached to the middle of the corpus bursae, and a narrower beak-shaped, thick-walled sack opposite and in front of the base of ductus seminalis.

Derivatio nominis. We dedicate the name of this species to the well-known and highly respected German specialist on Eupitheciini Mr. Hans-Joachim Weigt (Schwerte), who is the author of many excellent publications on European "Blütenspanner". His focus is on biology, ecology and photography of the species.

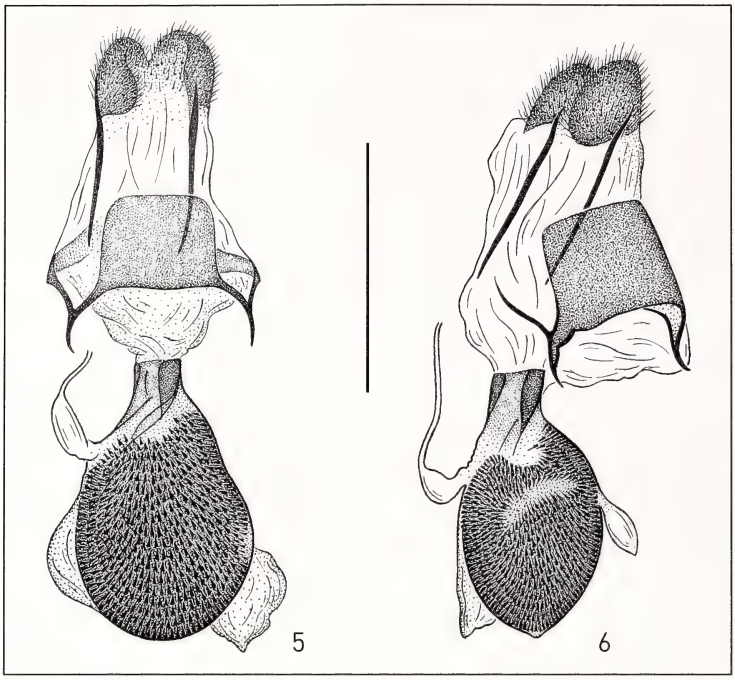
Remarks. Asian species *E. amasina*, *E. hilariata*, *E. achyrdaghica*, *E. sectila*, *E. pfeifferata*, *E. problematicata*, and *E. weigti* sp. n. are considered to form a group of closely allied species on the base of similarity of the male and female genitalia (Schütze 1960).

Eupithecia achyrdaghica Wehrli, 1929

Eupithecia achyrdaghica Wehrli, 1929, *Mitt. münch. ent. Ges.* 19 (10–12): 326, pl. 25, fig. 14. Syntypes 1♂, 2♀ (ZFMK; not traced), Syria [Turkey]: Achyr-Dagh, Bertiz Jaila, 1000–1800 m.

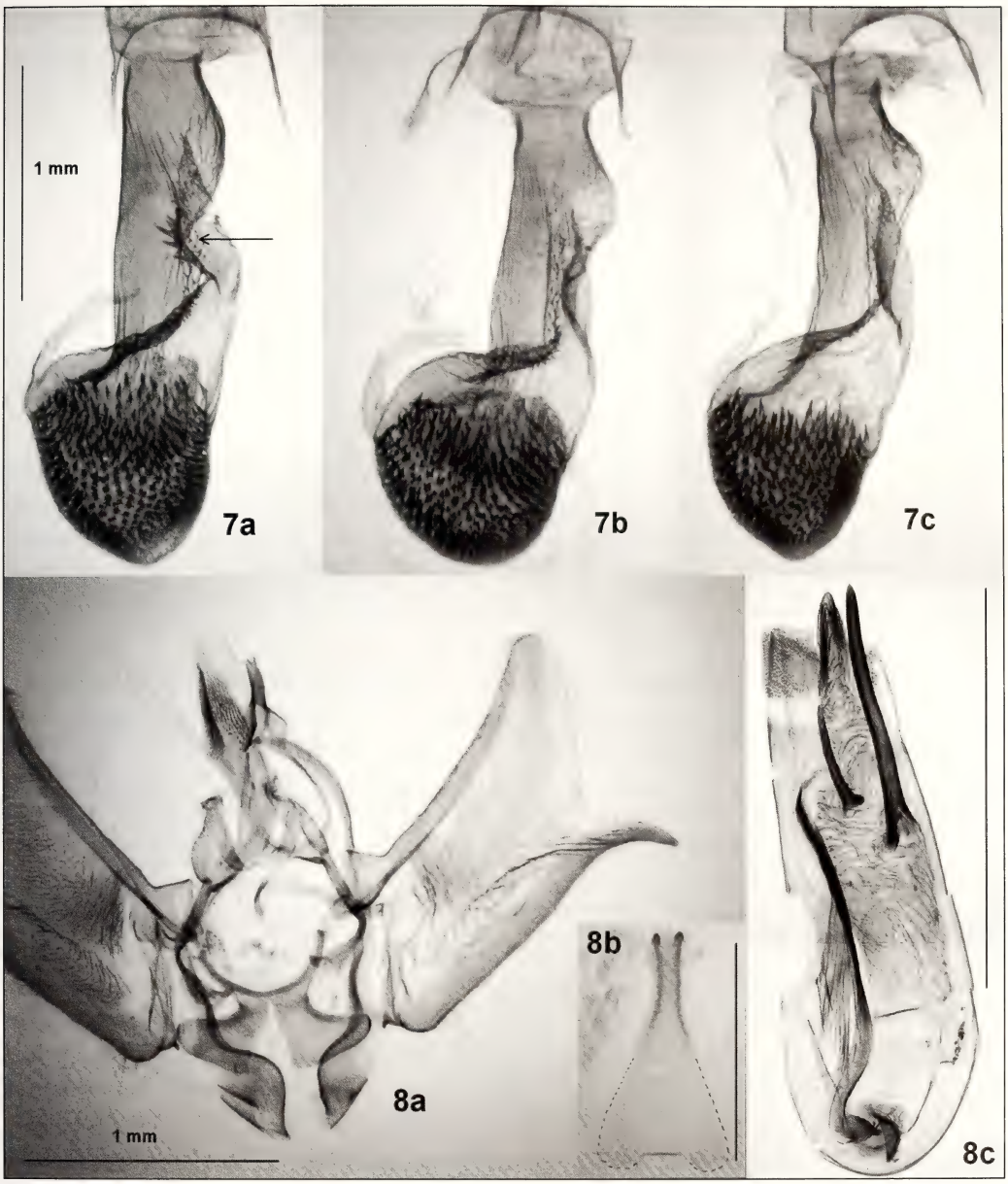
Material. 2♀, Syria, 25 km W v. Damaskus, 2–3.vi.1961, Kasy & Vartian leg., Ratzel slide no. 14609/2w (coll. Vartian in NHMW). The specimens were loaned by A. Vojnits from coll. Vartian some years ago and placed in TTM; they will be returned in the future to NHMW. There is one additional ♀ captured from the same locality and date in TTM.

This species was described from three specimens from Achyr-Dagh (formerly in Syria, now in Turkey). According to our data and recent personal comments of Hossein Rajaei (ZFMK), all the type specimens are unfortunately absent from the drawer with the



Figs 5–6. Female genitalia of *Eupithecia* spp. (scale bar = 1 mm). **5.** *E. weigti* Mironov & Ratzel, sp. n. **6.** *E. achyrdaghica* Wehrli, 1929 (Syria).

original species label "*achyrdaghica*" in the collection of ZFMK. The location of the types of this species is currently unknown. Wehrli (1929) illustrated the type specimen with a small black and white photograph, but did not provide an image of the genitalia. We illustrate here the female genitalia of recent material from Syria (Fig. 6). Because the types of *achyrdaghica* are absent and may be lost, and the type genitalia have not been illustrated, Wehrli's original detailed description is very important. We include here the most important parts of his text. "Grundfarbe oberseits ein weißliches Grau, sehr fein schwarz punktiert; die schwarzen Linien unterbrochen, nur aus Bogenstrichelchen und Aderpunkten zusammengesetzt, was der Art, zusammen mit der Farbe und den prominenten Mittelstrichen, ein sehr charakteristisches Aussehen verleiht. … Hfl. ähnlich dem Vfl., Costalzone etwas heller; die Linien reichen nicht bis zum Vorderrand. Basale, subbasale und antemediane Linien nur am Innenrand erkennbar. Mittelstrich kräftig. Die nur bis zum Mittelfleck reichende mittlere und die zwei nachfolgenden linien bilden vor dem Innenrand einen scharfen Zacken basalwärts. ... Der weibliche Kopulationsapparat erweist eine ziemlich nahe Verwandtschaft mit *E. alliaria* Stgr. Bursa kleiner als bei *alliaria*, dorsal ganz mit Stacheln besetzt, die feiner sind als bei jener. Ventral rechts eine kleine stachelfreie Fläche, links Gruppen größerer Stacheln. Auf der linken Seite, etwa in der Mitte, sitzt ein kleiner Bursaanhang, wie ihn von allen Eupithecien einzig *alliaria* besitzt. Der Ductus seminalis geht rechts ab und ist nicht wie bei *alliaria* … stark dorsal nach links gerückt, ein weiteres wichtiges Unterscheidungsmerkmal; seine Erweiterung beim Abgang erheblich kleiner bei der neuen Art. Der Ductus bursae kurz breit. Auf der ventralen Seite der Bursa oral ein merkwürdiges, breit aufsitzendes, kurz schnabelförmiges Gebilde. Nach dem Befund am Genitalorgan handelt es sich sicher um eine neue, bisher nicht bekannte Art, die zweite mit einem gestielten kleinen Bursa-Anhang, von *alliaria* verschieden unter Anderem durch den Sitz links, und den Abgang des ductus seminalis ganz rechts".



Figs 7–8. Genitalia of *Eupithecia ericeata* (Rambur) from Syria. **7a–7c.** Variation in the spines on bursa copulatrix in the female. **8a–8c.** Male.

In addition, we also provide a translation of this description, but it should be noted that the German text is mostly in note form, which makes it less comprehensible, and hence this translation is rather simple. "Groundcolour of upperside whitish grey; very finely dotted with black; the black lines disconnected, composed only of bent dashes and dots on the veins. Together with the colour and the prominent discal streaks this gives the species a very characteristic appearance. … Hindwing similar to forewing,

costa somewhat brighter; lines not reaching costal margin. Basal, subbasal and antemedial transverse lines only visible at inner margin. Discal dash strong. Middle transverse line only reaching discal dot. This and the two following lines forming a sharp basally-directed spike near the inner margin. ...

The female genitalia show a rather close relationship with *E. alliaria* Stdr. ... Bursa is smaller than in *alliaria*, dorsally completely covered with spines, which are finer than in *alliaria*. Ventrally on the right side a small area without spines, on the left groups of larger spines. On the left side, nearly in the center a small appendix of the bursa is located, as in *alliaria*; ... Ductus seminalis branches off on the right side and, unlike alliaria, is not moved far dorsally to the left side, an additional important differential character; the enlargement [of ductus] near the branching is notably smaller in the new species [*achyrdaghica*]. Ductus bursae short and broad. On the ventral side of the bursa [there is] orally a strange broadly based, short and beak-shaped structure. According to the genital organs this is certainly a new, hitherto unknown species, the second one with a small petiolated appendix of the bursa, differing from *alliaria* among other things by the placement [of the appendix] on the left side and the branching of the ductus seminalis on the right side".

Eupithecia ericeata (Rambur, 1833)

Larentia ericeata Rambur, 1833, *Annls Soc. ent. Fr.* 2 (1): 50, pl. 2, fig. 14. Lectotype ♀ (coll. C. Herbulot in ZSM; examined), [France]: [Corsica], Bastia.

Material. 1♂, Syria, prov. Ladhikiyah, Jabal an Nusayriyah, Slinf, 8–9.x.2004, P. Gyulai & A. Caral leg., Ratzel slide no. GU27911/2m (SMNK); 3♀, same locality, 17–18.x.2004, P. Gyulai & A. Caral leg., Ratzel slides nos GU27911/1w, GU27911/3w, GU27911/4w (SMNK).

All four known Syrian specimens of this Mediterranean species show considerable external variability, from the typical light form with distinct pattern on the forewings (Fig. 3) to unicolorous melanistic. The female genitalia are very variable as well: middle part of the ductus bursae with the longitudinal crest of five large spines in the first specimen, with only one similar large spine in the second and without large spines (as in European specimens) in the third specimen (Figs 7a–c). Possibly, this variability is a consequence of the influence of the extreme sunny conditions in desert areas, as well as in high mountain areas. Under these conditions the development of a subspecies of *Eupithecia ericeata* cannot be excluded. The male genitalia are similar to those from European specimens (Figs 8a–c).

Eupithecia variostrigata Alphéraky, 1876

Eupithecia variostrigata Alphéraky, 1876, *Horae Soc. ent. Ross.* 10: 40. Holotype ♂ (ZISP; not traced; one topotype in ZISP examined), Russia: Taganrog.

Material. 1♂, 1♀, Syria, prov. Dimashq, Jabal Lubnan ash Sharqi, Dier Atteian, W of Qarah, 10–11.x.2004, P. Gyulai & A. Caral leg., Ratzel slides nos GU27911/6m, GU27911/7w (SMNK); 1♂, Syria, prov. Dimashq, Jabal Lubnan ash Sharqi, Ma'lula, 11–12.x.2004, P. Gyulai & A. Caral leg., Ratzel slide no. GU27911/5m (SMNK).

This is a widespread and very characteristic Mediterranean autumnal species, occurring from the southern Spain in the west to the western Pamirs in the east (Mironov 2003). It is a well-recorded species in the countries adjacent to Syria (i.e., Turkey, Israel, Jordan, and Iran). *E. variostrigata* has not hitherto been recorded from Syria (Fig. 4).

Eupithecia reisserata Pinker, 1976

Eupithecia reisserata Pinker, 1976, *Z. ArbGem. öst. Ent.* 28 (1–3): 2, figs 5, 6, 19. Holotype ♂ (NHMW; 4 paratypes ♂, ♀ examined), [Turkey]: Anatolia, Kizilcahamam.
Eupithecia reisserata levarii Hausmann, 1991, *Mitt. Münch. ent. Ges.* 81: 133, pl. 6, figs 42, 43; pl. 13, fig. 135. Holotype ♂ (SMNK), Jordan (north): Rumman.

Material. 1♀, Syria, 25 km W. v. Damaskus, 15–16.V.1961, Kasy & Vartian, Vojnits slide no. 17468♀ (TTM).

This small East-Mediterranean species from the *interruptofasciata* group occurs in Greece along the coast of Aegean Sea, Crete, Cyprus, Turkey, Armenia, Azerbaijan (Nakhichevan region), and Jordan (subsp. *levarii* Hausmann, 1991). It is a new species to the fauna of Syria.

Eupithecia scalptata Christoph, 1885

Eupithecia scalptata Christoph, 1885, *in* Romanoff, *Mém. Lépid.* 2: 134, pl. 7, fig. 4. Lectotype ♂ (ZISP; examined), [Turkmenistan]: Askhabad.

Material. 1♀, Syria, 20 km NE v. Damaskus, 16–23.V.1961, Kasy & Vartian (TTM).

This is a handsome, very characteristic East-Mediterranean species, occurring from the southern Albania and Greece in the west to the Lower Volga region (Volgograd oblast) in the north-east and Turkmenistan and Iran in the south-east (Mironov 2003). *E. scalptata* has not hitherto been recorded from Syria.

Acknowledgements

We are grateful to Dr. R. Trusch and Mr. M. Falkenberg (SMNK, Karlsruhe), Dr. W. Mey (MNHU, Berlin), and Dr. A. Hausmann (ZSM, Munich) for kind support of the authors when visiting respectively the Staatliches Museum für Naturkunde Karlsruhe, Germany, Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany, and Zoologische Staatssammlung München, Germany. We are also grateful to Dr. D. Stüning (ZFMK) and Dr. L. Ronkay (TTM) for kind support of the first author when visiting their respective institutions. We are grateful also to Dr. S. Gaal-Haszler (NHMW) and Dr. L. Ronkay (TTM) for loan of material from NHMW to Karlsruhe (SMNK) which was loaned in former times from A. Vojnits and placed in TTM and Axel Steiner, Karlsruhe-Pfinztal for help with the exact translation of Wherli's text. Thanks are also due to the Deutsche Forschung Gemeinschaft (DFG, grants No. 436 RUS 17/99/02, No. STU 498/2-1 and No. TR 1086/1-1) that enabled extensive studies of Asian Eupitheciini in ZFMK, SMNK, ZSM, and MNHU.

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Wiltshire, E. P. 1936. More notes on the early stages of Syrian Lepidoptera. – The Entomologist's Record and Journal of Variation **48** (10, suppl.): 9–11.

Description d'*Apatetris* (*s. l.*) *mediterranella* sp. n. du littoral méditerranéen de France et d'Italie (Gelechiidae, Gelechiinae, Apatetrini)

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Résumé. *Apatetris* (*s. l.*) *mediterranella* **sp. n.** (Gelechiidae) est décrite d'Europe méditerranéenne. Sa position taxonomique est discutée. L'habitus, la tête, la nervuration et les genitalia mâles et femelles sont figurés.

Abstract. *Apatetris* (*s. l.*) *mediterranella* **sp. n.** (Gelechiidae) is described from the mediterranean littoral of Europe. Its taxonomic position is discussed. The habitus, head, wing venation and male and female genitalia are figured.

Introduction

Depuis maintenant plus d'une quinzaine d'années, l'un d'entre nous (Th.V.) capture régulièrement sur le littoral méditerranéen du Languedoc-Roussillon et de la Provence, des Pyrénées-Orientales jusqu'au Var, un microlépidoptère blanchâtre finement ponctué de brun d'environ 10 mm d'envergure. La longueur inhabituelle des antennes qui atteignent presque l'apex de l'aile antérieure nous avait laissé penser qu'il s'agissait d'une espèce inédite appartenant à un nouveau genre de Gracillariidae. Contacté à ce sujet en 2005, Paolo Triberti, spécialiste de cette famille, nous indique alors qu'il ne s'agit pas d'un Gracillariidae à cause de la structure des antennes, du 1er segment abdominal et des genitalia, en ajoutant qu'il ne voyait pas à quelle famille pourrait appartenir cette espèce. De même, à cause de la morphologie de la tête, nous avions également contacté notre ami Giorgio Baldizzone mais, là aussi, il nous a précisé qu'il ne s'agit pas d'un Coleophoridae.

Nous l'avions alors rapprochée des *Neomariania* Mariani, 1943, genre à la position incertaine au sein des Momphidae (*s. l.*), à cause de la morphologie de la tête, de la longueur des antennes, de la nervuration et de quelques ressemblances dans les genitalia mâles; mais, contacté à ce sujet, Peter Huemer nous dit alors connaître, avec Ole Karsholt, cette espèce depuis une dizaine d'années de la Corse et de la côte adriatique italienne, en nous informant qu'il s'agit d'un Gelechiidae d'une espèce inédite, aux ailes postérieures réduites, appartenant au genre *Apatetris* Staudinger, 1879: la réduction inhabituelle des ailes postérieures ne nous avait pas permis de la rattacher aux Gelechiidae qui, habituellement, ont des ailes postérieures plus larges et lobées. En fait, elle appartient bien au genre *Apatetris* Staudinger, 1879 (*s. l.*) comme nous le verrons dans la discussion ci-dessous.

Abréviations

CJN	Collection J. Nel, La Ciotat, France
MFSN	Museo Friulano di Storia Naturale, Udine, Italie
CThV	Collection Th. Varenne, Nice, France
TLMF	Tiroler Landesmuseum Ferdinandeum, Innsbruck, Autriche
ZMUC	Zoological Museum, University of Copenhagen, Copenhague, Danemark

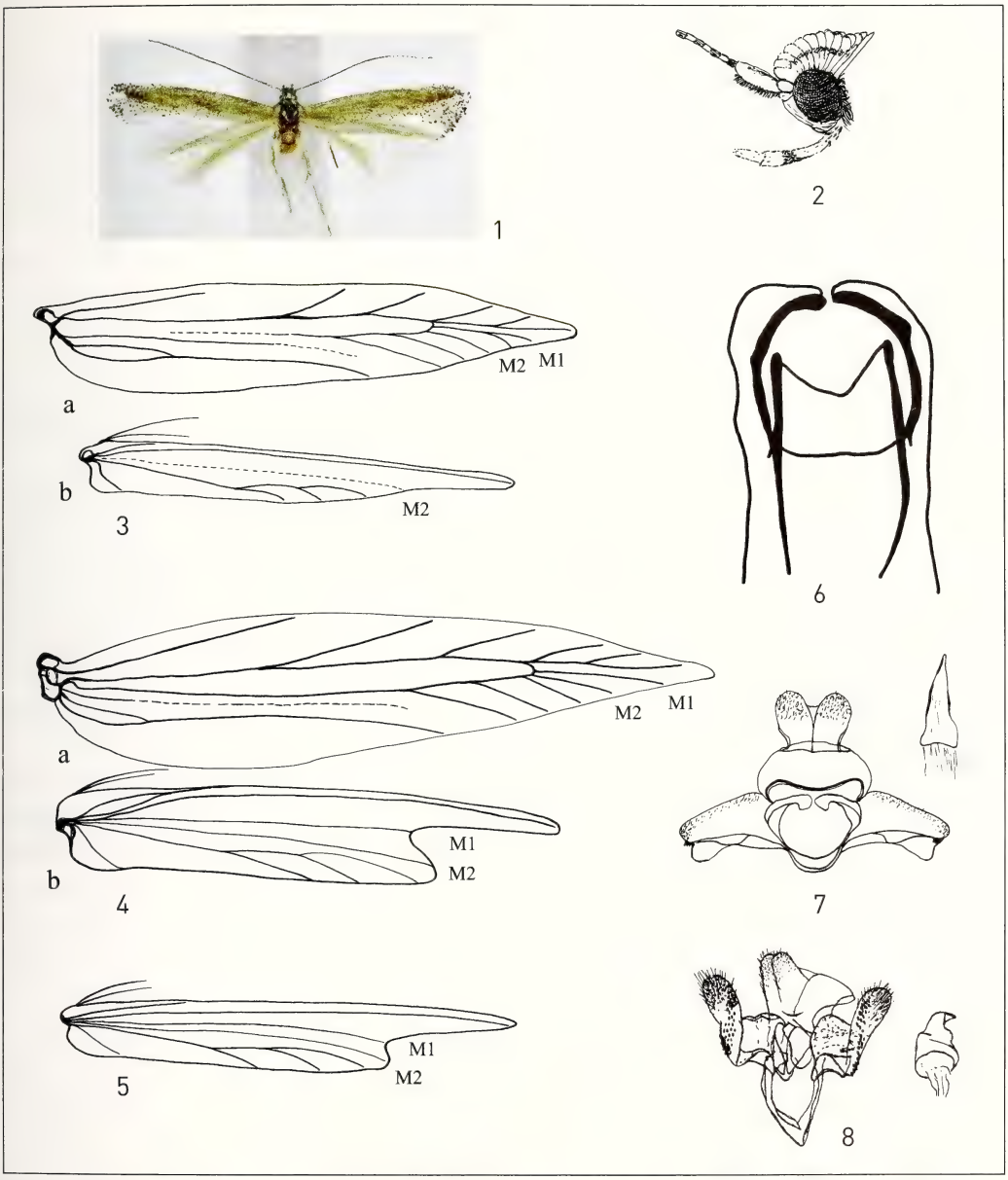
Description et position taxonomique

Apatetris (*s. l.*) *mediterranella* sp. n. — Figs 1–3, 6, 7, 9

Matériel. Holotype ♂: 1-'France, Mas Fondame | Salses-le-Château, 4 m | Pyrénées-Orientales | 1er juillet 2006, uv | Th. Varenne *leg.*' [imprimé en noir sur étiquette blanche]; 2- 'HOLOTYPE' [imprimé en noir sur étiquette rouge]; 3- 'prép. gen. JN n° 20558 | Apatetris mediterranella n. sp.' [écrit en noir à la main sur étiquette blanche] (CThV). Allotype ♀: **France**, Le Grau-du-Roi, Gard, 11.vii.2008, uv, Th. Varenne *leg.* (CThV). – Paratypes: 1♂, **France continentale**, Fréjus, embouchure de l'Argens, Var, 3.viii.1995, uv, Th. Varenne *leg.*, prép. gen. TV n° 1722 (CThV); 1♂, *idem*, 12.vi.1996, prép. gen. TV n° 1450 (CThV); 2♀, Riberette, Argelès-sur-Mer, Pyrénées-Orientales, 25.vi.1998, uv, Th. Varenne *leg.*, prép. gen. JN n° 7792 et n° 7775 (CJN, CThV); 1♂, Les Vieux Salins, Hyères, 2 m, Var, 29.viii.2000, uv, Th. Varenne *leg.*, prép. gen. JN n° 16874 (CJN); 1♂, Fos-sur-Mer, Bouches-du-Rhône, 26.vii.2001, uv, Th. Varenne *leg.* (CThV); 1♂, Leucate, Aude, 8.vi.2003, uv, Th. Varenne *leg.* (CThV); 1♀, Vias, Hérault, 4.vii.2003, uv, Th. Varenne *leg.*, prép. gen. JN n° 16370 (CThV); 1♂, Gruissan, Aude, 14.viii.2003, uv, Th. Varenne *leg.* (CThV); 1♀, Salses-le-Château, Pyrénées-Orientales, 1.vii.2006, uv. Th. Varenne *leg.* (CThV); 1♀, bord du Rhône, Arles, Bouches-du-Rhône, 5.viii.2007, uv, Th. Varenne *leg* . (CThV); 1♀, le Grau-du-Roi, Gard, 11.vii.2008, uv, Th. Varenne *leg.* (CThV); 1♀, Capoulade, Gruissan, 3 m, Aude, 26.ix.2011, uv, Th. Varenne *leg.*, prép. gen. JN n° 25174, aile prép. JN n° 25376 (CJN); 1♂, **Corse**, Calvi, 10 m, 18–19. viii.1998, *leg.* O. Karsholt (ZMUC); 2♂, 15 km SSE Bastia, l'Etang Biguglia, 10 m, 20.vi.2005, *leg.* B. Skule (ZMUC). 2♂, **Italie**, Friuli Venezia Giulia, Prov. Gorizia, Staranzano, loc. Cona (Canale Quarantia), 13.viii.2000, *leg.* L. Morin (gen. slide GU 05/1230 P. Huemer, gen. slide without number in tube) (MFSN); 1♂, Friuli Venezia Giulia, Prov. Gorizia, Staranzano, loc. Riva Lunga, 16.viii.2001, *leg.* G. Governatori, Barcode TLMF Lep 04988 (TLMF); 1♀, Friuli Venezia Giulia, Prov. Gorizia, Monfalcone, Biotopo Palude del Fiume Cavana, 14.viii.2001, *leg.* P. Huemer & S. Erlebach (TLMF).

Description

Habitus (Fig. 1) de coloration générale blanchâtre; envergure de 8 à 10 mm; tête (Fig. 2) recouverte d'écailles aplaties, très grandes sur le dessus depuis le front jusqu'à la jonction du thorax, sans collier d'écailles, le thorax semblant se prolonger vers la tête sans interruption; front uni; tête et front blanchâtres, latéralement finement mouchetés de brun jaunâtre clair; palpes labiaux blanchâtres, le médian un peu épaissi vers l'apex et finement moucheté de brun jaunâtre clair ventralement; palpes longs d'environ 2,5 fois le diamètre de l'œil, très peu arqués, rectilignes, le 3ème segment court, long de 0,5 fois le diamètre de l'œil et le 2ème segment aussi long que 2 fois le diamètre de l'œil; trompe présente mais courte, écailleuse à sa base; palpes maxillaires rudimentaires. Scape antennaire allongé, subovale, aussi long que le diamètre de l'œil, ventralement garni de soies saillantes, blanchâtre à peine moucheté de brun jaunâtre clair, cils du côté ventral blanc crème; flagellum (Fig. 1) atteignant l'apex de l'aile antérieure hors franges; tegulae blanches, mouchetées de brun jaunâtre clair sur leurs deux tiers basaux; thorax blanchâtre; pattes blanches soyeuses à leur base, mouchetées latéralement de brun jaunâtre clair. Ailes allongées: nervuration des ailes antérieures



Figs 1–8. Morphologie de diverses espèces d'*Apatetris*. **1.** Habitus d'*A. mediterranella* sp. n., le Grau-du-Roi (Gard), 11 juillet 2008, Th. Varenne *leg*., photo Th. Varenne. **2.** Tête d'*A. mediterranella* sp. n. **3.** Nervuration d'*A. mediterranella* sp. n.: **a**, aile antérieure; **b**, aile postérieure. **4.** Nervuration d'*A. kinkerella* (Snellen, 1876): **a**, aile antérieure; **b**, aile postérieure. **5.** Nervuration d'*A. trivittellum* (Rebel, 1903), aile postérieure. **6.** Structures de renforcement abdominales d'*A. mediterranella* sp. n. **7.** Genitalia mâles d'*A. mediterranella* sp. n., paratype, prep. gen. JN n° 16874. **8.** Genitalia mâles d'*A. kinkerella* (Snellen, 1876), d'après Elsner & al. (1999).

(Fig. 3a) complète avec R4 et R5 tigées atteignant le bord supérieur de l'aile et M1 et M2 également tigées, atteignant le bord postérieur; les autres nervures sont libres, A1 et A2 anastomosées; ailes entièrement blanchâtres, finement ponctuées d'écailles

brun jaunâtre clair qui, par endroits, sont plus denses et ont tendance à former deux taches selon les exemplaires, l'une au centre de l'aile et l'autre près du bord ventral, mais ces taches restent mal définies; franges longues, soyeuses avec un reflet un peu doré, ornées de quelques écailles brunes irrégulièrement disposées. Ailes postérieures (Fig. 3b) étroites, allongées, non lobées, avec une nervuration incomplète et réduites: Sc courte et peu visible à la base; Rs libre et se prolongeant jusqu'à l'apex; M2 libre, peu marquée et réduite à un pli; CuA2, CuA1 et M3 arquées; CuP absente; 1A+2A très courte; ailes gris jaunâtre clair, franges longues et soyeuses, un peu dorées, sans écailles brunes. Système de renforcement de l'abdomen (Fig.6)s: bande transversale fine, peu développée; bandes latérales du 1er tergite plus épaisses, arquées, celles du 2e tergite absentes ou excessivement réduites; bandes du 1er sternite très longues, assez rectilignes. Disques des tergites II à VII absents.

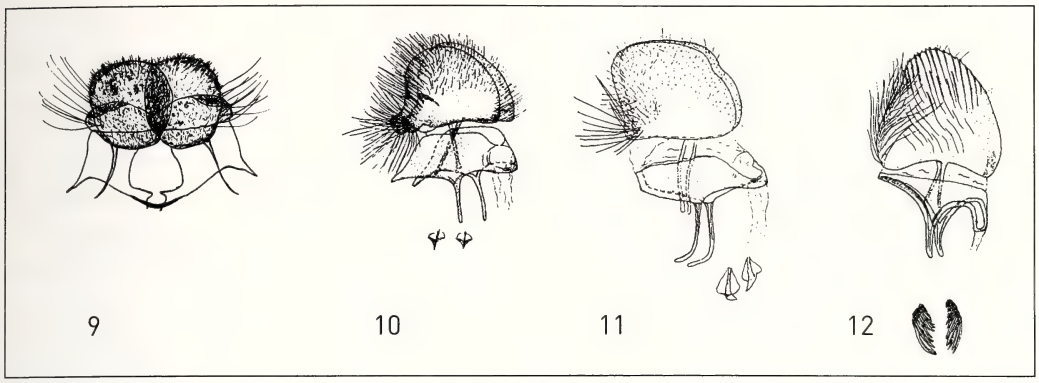
Genitalia mâles (Fig. 7): uncus court, avec une courte pilosité peu dense, formé de deux grands lobes arrondis à l'apex, connivents, deux fois plus longs que larges; la base de l'uncus s'insère en arrière du tegumen qui est large et court; transtilla courbes, épaisses, terminées en spatules; saccus plus ou moins triangulaire, arrondi; valves relativement courtes, bord dorsal convexe dans la moitié basale, arrondies à l'apex qui est armé ventralement d'une masse arrondie de 3–4 petites épines triangulaires noires très courtes; bord ventral de la valve avec deux grands lobes: l'un, subovale, occupe la moitié distale, l'autre, occupe la moitié proximale et constitue un élargissement triangulaire entre la valve et le saccus, et n'est pas toujours bien visible car il peut être replié longitudinalement. Phallus très court, petit, cylindrique fusiforme.

Genitalia femelles (Fig. 9): papilles anales arrondies, très larges et se superposant, avec un très large lobe basal chacune, grand et arrondi garni de longues soies; apophyses postérieures courtes, un peu moins longues que le diamètre des papilles anales; segment VIII inscrit dans un rectangle deux fois plus large que haut, avec le bord proximal convexe et plus sclérifié au niveau de l'ostium; apophyses antérieures très courtes, trois fois plus courtes que les postérieures; ostium large, arrondi, avec deux petites languettes latérales sur le bord ventral; ductus bursae et bursa copulatrix transparents, mal définis, sans signum.

Diagnose. *A. mediterranella* s'apparente au groupe des *Apatetris* à l'habitus clair finement moucheté de gris comme *A. kinkerella*. Elle s'en distingue aisément par ses ailes postérieures étroites non bilobées à l'apex, et ses longues antennes qui atteignent presque l'apex de l'aile. Les genitalia mâles (Figs. 7, 8) et femelles (Figs. 9, 11) permettent également de bien la reconnaître en cas de doute (voir ci-dessus).

Position taxonomique. Contacté au sujet de cette espèce, Huemer (*in litteris*) nous écrit: "Ce que je peux vous dire est, qu'en plus de plusieurs caractères morphologiques propres aux Apatetrini, nous avons également le premier barcode qui la rapproche également du genre *Apatetris*."

Staudinger (1879) et Meyrick (1925) caractérisaient le genre *Apatetris* par l'apex bilobé des ailes postérieures (Figs 4 b, 5) et par la pectination du scape antennaire (présente chez la nouvelle espèce). Janse (1951), Piskunov (1981) (partiellement) et Sakamaki (2000) caractérisent les *Apatetris* par la combinaison des caractères suivants que l'on retrouve chez la nouvelle espèce: une trompe courte, des palpes maxillaires



Figs 9–12. Genitalia femelles d'espèces d'*Apatetris*. **9.** *A. mediterranella* sp. n., paratype, prep. gen. JN n° 25174. **10.** *A. altithermella* (Walsingham, 1903), d'après Elsner & al. (1999). **11.** *A. kinkerella* (Snellen, 1876), d'après Elsner & al. (1999). **12.** *A. trivittellum* (Rebel, 1903), d'après Elsner & al. (1999).

rudimentaires, des palpes labiaux assez courts, peu arqués, aux ailes postérieures M1 et M2 (ici seulement M2) rudimentaires, permettant aux ailes de se plier longitudinalement, dans les genitalia mâles un tegumen court, un uncus court parfois avec deux grands lobes arrondis comme chez *A. kinkerella* (Snellen, 1876) (Fig. 8), un phallus court, dans les genitalia femelles des papilles anales arrondies, très larges avec des apophyses courtes ou très courtes et un segment VIII large et très court (Figs 10, 11, 12).

Junnilainen & Nupponen (2010) placent plusieurs espèces dans des genres différents: *A. altithermella* (Walsingham, 1903) et *A. kinkerella* (Snellen, 1876) dans le genre *Dactylotula* Cockerell, 1889; *A. trivittellum* (Rebel, 1903) et deux espèces nouvelles de l'Oural dans le genre *Catatinagma* Rebel, 1903. Ils justifient ces nouvelles combinaisons par la comparaison d'une douzaine de caractères, mais ils ne prennent pas en compte ni *Apatetris agenjoi* Gozmány, 1954, ni certaines espèces japonaises, ni d'autres genres comme *Epidola* Staudinger, 1859 ou *Oecocecis* Guenée, 1870, ce qui ne nous permet pas d'avoir une vision globale des Apatetrini et de placer ou non *A. mediterranella* dans un genre précis.

Toutefois, la nouvelle espèce présente des caractères qui lui sont propres et qui pourraient justifier sa place dans un nouveau genre: les antennes sont bien plus longues que chez les autres *Apatetris* (*s. l.*), aux ailes antérieures M1 et M2 sont tigées, les ailes postérieures sont très réduites, non bilobées à l'apex (on note chez certains *Apatetris* comme *A. trivittellum* (Fig. 5) une tendance vers cette réduction), l'apex des valves des genitalia mâles présente un groupe de petites épines, les papilles anales des genitalia femelles sont très arrondies, non anguleuses à la base, les apophyses antérieures sont particulièrement courtes et aucun signum n'a été détecté comparés aux autres espèces européennes (Figs 10, 11, 12).

En conclusion, en accord avec Sakamaki (*op. cit.*) et Huemer (*in litteris*) et dans l'attente d'une étude globale cladistique et / ou ADN de la tribu Apatetrini, la nouvelle espèce est décrite ici, pour l'instant, dans le genre *Apatetris* Staudinger, 1879 *s. l.*

Biologie. La ou les plantes-hôtes sont inconnues. La seule espèce européenne dont la biologie est connue, *A. kinkerella*, est inféodée à *Ammophila arenaria* (L.) Link.

(Poacée) "Roseau des sables", ce qui pourrait être une piste de recherche pour *A. mediterranella* qui vit sur le littoral. Une autre espèce du Japon, *A. elymicola* Sakamaki, 2000 est inféodée à *Elymus mollis*, autre Poacée (Sakamaki, *op. cit.*).

Les captures s'échelonnent entre le 8 juin et le 26 septembre; les exemplaires pris en août-septembre sont souvent plus petits que ceux de juin-juillet: deux générations ou une seule étalée avec des éclosions en continu, les deux hypothèses restent ouvertes.

Répartition. En France continentale, *A. mediterranella* a été observée depuis les Pyrénées-Orientales à l'ouest jusqu'à l'embouchure de l'Argens (Fréjus) à l'est, dans des stations littorales ou proches du littoral avec à proximité immédiate des zones très humides de marécages d'eau douce ou saumâtre. La localité la plus à l'intérieur des terres est celle d'Arles (Bouches-du-Rhône) mais c'est en bordure des marais qui longent le Grand Rhône. Toutes les autres sont franchement en bord de mer ou de zones lagunaires côtières; deux biotopes sont en arrière de dunes de sable mais toujours avec des marais: le Grau-du-Roi (Gard) et Vias (Héraut). Elle est également connue du littoral de la Corse et de la côte adriatique en Italie, toujours dans les mêmes biotopes. Cette espèce pourra être recherchée également en Espagne où des biotopes favorables existent certainement, comme par exemple à l'embouchure de l'Ebre.

Etymologie. "*mediterranella*" pour rappeler sa répartition et ses biotopes littoraux méditerranéens.

Liste Leraut (1997): *Apatetris mediterranella* pourra être placée après *A. trivittellum* (Rebel, 1903), n° 1447a.

Remerciements

Nous avons le plaisir de remercier Paolo Triberti (Verona, Italie) et Giorgio Baldizzone (Asti, Italie) qui ont bien voulu examiner ou nous donner leur avis sur cette nouvelle espèce. Nous remercions également Ole Karsholt (Copenhagen, Danemark) et Peter Huemer (Innsbruck, Autriche) pour leur aide décisive et pour la communication de leurs données, ainsi que Bernard Landry (Genève, Suisse) pour la relecture constructive de notre travail.

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Additions to the checklist of Bombycoidea and Noctuoidea of the Volgo-Ural region. Part II. (Lepidoptera: Lasiocampidae, Erebidae, Nolidae, Noctuidae)

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Abstract. Faunistic records additional to the recently published lists of Bombycoidea and Noctuoidea of the South Ural Mountains (Nupponen & Fibiger 2002, 2006) are presented, as well as some interesting records from the North Urals and the Lower Volga region. The material in the southern Urals was collected during 2006–2010 in six different expeditions, in North Ural in 2003 and 2007, and in the Lower Volga region in 2001, 2002, 2005, and 2006 in four expeditions. Four species are reported for the first time from Europe: *Dichagyris latipennis* (Püngeler, 1909), *Pseudohermonassa melancholica* (Lederer, 1853), *Spaelotis deplorata* (Staudinger, 1897), and *Xestia albonigra* (Kononenko, 1981). Fourteen species are reported for the first time from the southern Urals. Altogether, records of 68 species are reported, including a few corrections to the previous articles. Further illustrations and notes on some poorly known taxa are given.

Introduction

The fauna of Bombycoidea and Noctuoidea of the southern Ural Mountains has been studied intensely since 1996, and the results of the research during 1996–2005 were published by Nupponen & Fibiger (2002, 2006). Since 2005, several further expeditions were made to the Urals by the first author. The results of these trips are summarized in the present paper, as well as some noteworthy records from the Lower and Middle Volga region.

Material and Methods

The present article is based on the material collected by Kari Nupponen during 2006–2010 on six different expeditions to the southern Urals, four expeditions to the Lower and Middle Volga region in 2001, 2002, 2005 and 2006, and two short trips to the North Urals in 2003 and 2007. A few specimens recorded by Vladimir Olschwang, Pavel Gorbunov, and other collectors are included as well. The fieldwork comprised 48 days in the southern Ural, and 32 days in the Lower and Middle Volga region. The dates and areas visited on each of the trips are as follows:

(a) South Ural

1: 16.viii.–23.viii.2006; Orenburg oblast, Cheliabinsk oblast, Sverdlovsk oblast; K. Nupponen.
2: 8–23.vii.2007; Cheliabinsk oblast, Sverdlovsk oblast, Bashkiria; K. Nupponen.
3: 2–11.x.2007; Orenburg oblast, Cheliabinsk oblast, Sverdlovsk oblast; K. Nupponen.
4: 4–12.ix.2009; Orenburg oblast, Cheliabinsk oblast; K. Nupponen & P. Gorbunov.

5: 21–22.v.2010 & 25–26.v.2010; Cheliabinsk oblast, Sverdlovsk oblast; K. Nupponen & P. Gorbunov.
6: 14.ix.2010; Orenburg oblast; K. Nupponen & P. Gorbunov.

(b) The Lower and Middle Volga region

1: 29.v.–6.vi.2001; Saratov oblast, Volgograd oblast, Astrahan oblast; K. Nupponen.
2: 1–8.ix.2002; Saratov oblast, Volgograd oblast; K. Nupponen.
3: 14–19.v.2005; Saratov oblast, Volgograd oblast; K. Nupponen.
4: 25.viii.–02.ix.2006; Saratov oblast; Volgograd oblast, Astrahan oblast; K. Nupponen.

(c) North Ural

Two short trips were made during 10–11.vii.2003 and 10–14.vii.2007. The material was mainly collected by artificial light at night. Sugar ropes (sisal ropes soaked in red wine and sugar) were used in the second half of the summer, and some day-active species were recorded by netting during daytime. The collected material is generally deposited in the private collection of T. & K. Nupponen.

Collecting sites

The collecting localities are listed below. Brief variations of locality names are given in uppercase letters before each locality and used later in the species list. The localities are grouped regionally. For further information of the localities, see Nupponen & Fibiger (2002).

Collecting sites in South Ural

BOGDANOVKA: Cheliabinsk oblast, 52°24'N 64°04'E, 280 m, Ural River bank by Bogdanovka Village. 21–22.v.2010.

BURANNOE: Orenburg oblast, 50°58'N 54°25'E, 100 m, near Burannoe Village, Ilek River Valley. 18–19.viii.2006.

CHALK HILLS: Orenburg oblast, 50°40–45'N 54°26–28'E, 170–230 m, Pokrovka Village 20 km S, Schibendy Valley. 20–22.viii.2006, 05–10.x.2007.

GUBERLJA: Orenburg oblast, 51°09–12'N 58°02–08'E, 320 m, Orsk 40 km W, near Guberlja Village. 09.ix.2009.

GUBERLJA SPRING: Orenburg oblast, 51°09'N 58°03'E, 330–360 m, Orsk 40 km WSW, spring near Gubrlja River. 07–08.ix.2009.

IREMEL: Cheliabinsk oblast, 54°31–35'N 58°49–54'E, 900–1580 m, Iremel Mountains. 18–19.vii.2007.

KAMENKA: Cheliabinsk oblast SW, 52°31–32'N 59°03–04'E, 275–380 m, Ural River near Kamenka Village. 12.ix.2009.

KIZILSKOYE: Cheliabinsk oblast, 52°39'N 59°00'E, 300 m, Kizilskoye 15 km S, near Ural River. 11.x.2007.

KUMAK RIVER: Orenburg oblast, 51°14–18'N 59°02–22'E, 215–270 m, Kumak River. 10–11.ix. 2009, 14.ix.2010.

KUZINO: Sverdlovsk oblast, 57°00'N 59°26'E, 320 m, Kuzino Village. 25–26.v.2010.

MIASS: Cheliabinsk oblast, 55°01'N 60°06'E, 350 m, Miass, Ilmen State reserve. 16–19.vii.2007.

MOSKOVO: Cheliabinsk oblast, 53°57'N 59°03'E, 650 m, near Moskovo Village. 16.viii.2006, 16–17.vii.2007.

ORENBURG: Orenburg oblast, 51°43'N 54°54'E, 95 m, Orenburg city SW. 04.x.2007.

SOROCHINSK: Orenburg oblast W, 52°26–29'N 53°10–12'E, 200 m, Sorochinsk Village 5 km N. 23.viii.2006.

UCHALY II: Cheliabinsk oblast, 54°04–10'N 59°35–44'E, 440–580 m, Uchaly Village 25 km SE. 04.ix.2009.

VERBLJUSHKA: Orenburg oblast, 51°23'N 56°49'E, 130–340 m, Donskoje Village 6 km W, Mount Verbljushka. 17.viii.2006, 03.x.2007, 05–06.ix.2009.

Collecting sites in the Lower and Middle Volga region

OLHOVKA: Volgograd oblast, 49°34–41'N 44°16–19'E, 60–120 m, Olhovka Village 20 km SW. 01.vi. 2001, 05–06.vi.2001, 03–04.ix.2002, 06–07.ix.2002, 15.v.2005, 18.v.2005, 25.viii.2006.

BOGDO: Astrakhan oblast, 48°07–11'N 46°48–54'E, -20–150 m, Baskunzak salt lake SW, Bogdo. 04.vi.2001, 26–28.viii.2006.

BASKUNZAK W: Astrakhan oblast, 48°10–13'N 46°33–38'E, 0–10 m, Baskunzak salt lake 20 km W. 03.vi.2001.

SASYKOLI: Astrakhan oblast, 47°34'N 47°01'E, -9–5 m, Sasykoli Village 3 km NE, Peski Voniutchie. 29–30.viii.2006.

PESKI THIKILI: Astrakhan oblast, 48°02–03'N 46°37–40'E, 5–10 m, Peski Thikili near Bogdo Village. 30.viii.2006.

FROLOVO: Volgograd oblast, 49°33-38'N 43°16–28'E, 95–110 m, Frolovo Village 30 km SW. 16–17.v.2005.

ILOVLA: Volgograd oblast, 49°13–26'N 43°41–56'E, 45–65 m, Ilovla Village 10 km WSW. 02.vi.2001, 05.ix.2002.

PUGATSEV N: Saratov oblast N, 52°06'N 49°04'E, 45 m, Pugatsev Village 22 km N. 01.ix.2006.

PUGATSEV: Saratov oblast, 52°02'N 49°04'E, 35 m, near Pugatsev Village. 02.ix.2002.

BANNOVKA: Saratov oblast S, 50°44'N 45°37'E, 150 m, near Nizhnaja Bannovka Village. 31.viii.2006.

Checklist

The systematics follow that of Zahiri et al. (2011) and nomenclature that of Fibiger & Hacker (2005). The dates and localities of records for each species are given, as well as further notes on some poorly known species. The present list includes only additions and corrections to our previous reports from South Ural (Nupponen & Fibiger 2002, 2006), and additionally some noteworthy records from the Lower and Middle Volga region and northern half of the Ural Mountains. Records of widely distributed taxa are generally excluded, as well as further observations from localities where the species was previously known. The species included in the list were either recorded as new since our previous reports (marked by an asterisk [*]), or recorded in the new areas located considerably to the north (Sverdlovsk and Cheliabinsk oblasts) or to the south (Orenburg oblast) from earlier records. Further records of some species and second generations are included too, as well as a few earlier reported but incorrectly determined taxa.

Lasiocampidae

*** *Dendrolimus kilmez* Mikkola & Ståhls, 2008**

Miass 28.vi.1997 2♂

Distribution. Central Russia (Udmurtia, republic of Mari El, C Ural).
Remarks. The two specimens are included in the type series. Three species of *Dendro-*

limus occur in Miass: *D. pini* (Linnaeus, 1758), *D. sibiricus* Tshetverikov, 1908 and *D. kilmez*. For further information, see Mikkola & Ståhls (2008).

*** *Phyllodesma japonicum* (Leech, 1889)**

Kuzino 25.v.2010 1♂

Remarks. The specimen from Ural is externally similar to those from Estonia (ssp. *arboreum* Blöcker, 1908). New to the Ural region.

Erebidae

***Schrankia balneorum* (Alphéraky, 1880)**

Bogdo 28.viii.2006 1♀; Burannoe 18–19.viii.2006 25 exx; Chalk Hills 20–22.viii.2006 15 exx; Peski Thikili 30.viii.2006 1♂; Pugatsev N 01.ix.2006 6 exx

Remarks. The habitat of *S. balneorum* in Burannoe is illustrated in Fig. 1.

***Eublemma debilis* (Christoph, 1884)**

Bogdo 26–28.viii.2006 3♂

Remarks. In addition to the present records, only two further specimens of *E. debilis* are known from Europe (Fibiger et al. 2010). Two of the specimens from Bogdo are illustrated in Fibiger et al. (2010: plate 4, figs 35, 37). The habitat of *E. debilis* in Bogdo is a desert steppe at the shore of Baskunzak salt lake (Fig. 2). In W Kazakhstan, the species inhabits semideserts and, contrary to Fibiger et al. (2010), occurs in two generations, of which the first one is flying in May and early June and is more abundant (K. Nupponen & P. Gorbunov, unpublished).

***Rhynchodontodes ravulalis* (Staudinger, 1879)**

Burannoe 18–19.viii.2006 15 exx

Remarks. The habitat of *R. ravulalis* in Burannoe is illustrated in Fig. 1.

***Hypena opulenta* (Christoph, 1877)**

Ilovla 5.ix.2002 1♂

***Drasteria flexuosa* (Ménétriés, 1848)**

Bogdo 26.viii.2006 1♂, 1♀; Sasykoli 29.viii.2006 1♂

***Drasteria picta* (Christoph, 1877)**

Sasykoli 29.viii.2006 about 40 exx

***Euclidia fortalitium* (Tauscher, 1809)**

Bogdo 27.viii.2006 1♀; Burannoe 18.viii.2006 1♀; Chalk Hills 22.viii.2006 1♂; Frolovo 16.v.2005 1♀; Kizilskoye 19–20.v.2007 2♂ (P. Gorbunov leg.)

Fig. 1. Sandy steppe and moist patches with plenty of *Salix* and *Populus* by Burannoe Village, South Ural. Habitat of *Schrankia balneorum*, *Rhynchodontodes ravulalis*, *Nycteola kuldzhana*, and *Cucullia inderiensis* (Photo: K. Nupponen).

Remarks. The main flight period of *E. fortalitium* is July in the southern Urals, while the species is clearly bivoltine in the Lower Volga region (Nupponen & Fibiger 2002; Goater et al. 2003). However, two specimens collected in mid-May in Kiziskoye might indicate that some populations are bivoltine in the Urals too. The two specimens are dark and very small in size, possibly due to abnormal conditions during their larval stage.

Pericyma albidentaria (Freyer, 1842)

Bogdo 4.vi.2001 1♂, 26–27.viii.2006 6 exx; Peski Thikili 30.viii.2006 3♂; Sasykoli 29.viii.2006 2♂

* *Clytie gracilis* (A. Bang-Haas, 1907)

Baskunzak W 3.vi.2001 1♂; Chalk Hills 22.viii.2006 1♂; Sasykoli 29.viii.2006 1♂, 1♀

Dysgonia rogenhoferi (Bohatsch, 1880)

Sasykoli 30.viii.2006 1♂

Remarks. The specimen from Sasykoli is illustrated in Fibiger et al. (2010: pl. 16, fig. 29), and the collecting site in Fig. 3. The present record is the second one of the species from Europe (see Fibiger et al. 2010).

Dysgonia algira (Linnaeus, 1767)

Ilovla 5.ix.2002 1♂

Remarks. The species occurs only as a migrant in the Volgo-Ural region.

Fig. 2. Desert steppe and rocky slopes of the Bogdo Hill by Baskunzak salt lake, Astrakhan oblast. Habitat of *Eublemma debilis*, *Scythocentropus misella*, *Luperina taurica*, *Pseudohadena schlumbergeri*, *Euxoa deserta*, and *Euxoa fallax* (Photo: K. Nupponen).

Prodotis stolida (Fabricius, 1775)

Olhovka 4.ix.2002 1 ex, 7.ix.2002 1 ex

Remarks. The species occurs only as a migrant in the Volgo-Ural region.

Pararctia tundrana (Tshistjakov, 1990)

Polar Ural, Voikar River, vii.2008 1♂ (M. Golovatin leg.; coll. T. & K. Nupponen)

Remarks. *P. tundrana* occurs in the arctic regions of the Eastern Palaearctic area. The western boundary of the species distribution is in the Polar Ural.

Borearctia menetriesii (Eversmann, 1846)

North Ural, 60°28'N 59°40'E, 260 m, Denetshkin Kamen (N slope, taiga forest) 20.vii.2005 1♀ (A. Ermakov leg.; coll. T. & K. Nupponen)

Remarks. A dead female of *B. menetriesii* was found on a branch of *Picea*, where its left forewing was apparently fixed after emerging. The habitat is a taiga forest, with limited luxurious meadows and a small river in a forest (Figs 4, 5).

Nolidae

* *Nycteola eremostola* Dufay, 1961

Chalk Hills 26.ix.2005 1♂; Kumak River 10.ix.2009 1 ex, 11.ix.2009 1 ex

Fig. 3. Sandy desert with *Calligonum* and patches of *Salix* by Sasykoli Village near the River Volga, Astrakhan oblast. Habitat of *Dichagyris latipennis* and *Dysgonia rogenhoferi* (Photo: K. Nupponen).

Remarks. Earlier reports of *Nycteola siculana* (Fuchs, 1899) from southern Urals refer to *N. eremostola* (see Nupponen & Fibiger 2002, 2006; Fibiger et al. 2009). In addition to 'normal' greyish specimens (see Fibiger et al. 2009), there also exists a colour form with reddish brown costal half of medial area of the forewings (Fig. 6).

* *Nycteola kuldzhana* Obraztsov, 1953

Burannoe 18.viii.2006 2♂, 19.viii.2006 4♂, 1♀

Remarks. One of the specimens from South Ural is illustrated in Fibiger et al. (2009: pl. 7, fig. 63). For further notes on this species, see Fibiger et al. (2009). The habitat of *N. kuldzhana* in Burannoe is illustrated in Fig. 2.

Noctuidae

Trichosea ludifica (Linnaeus, 1758)

North Ural, 60°28'N 59°40'E, 260 m, Denetshkin Kamen (N slope) 13.vii.2007 1♂

Cucullia mixta Freyer, 1842

Chalk Hills 8.x.2007 1♂

Remarks. The specimen was newly emerged. First record of the second generation of this species in the Urals.

***Sympistis nigrita* (Boisduval, 1840)**

North Ural, 60°24–26'N 59°29–36'E, 1000–1250 m, Denetshkin Kamen, mountain tundra, 12.vii.2007 1♂, 4♀; 13.vii.2007 1♂, 1♀; North Ural, 59°30–32'N 59°09–11'E, 600–1519 m, near Kytlym Village, Kosvinskij Kamen 11.vii.2003 1♀

***Oncocnemis senica* (Eversmann, 1856)**

Moskovo 16.viii.2006 1♂

***Caradrina expansa* (Alphéraky, 1887)**

Burannoe 19.viii.2006 1♀; Bogdo 26.viii.2006 2♂, 2♀; 27.viii.2006 2♂, 1♀; Chalk Hills 22.viii.2006 1♀; Sasykoli 29.viii.2006 1♂, 2♀; Pugatsev N 01.ix.2006 4♂, 6♀

Remarks. *C. expansa* was recently reported from Europe (Nupponen & Fibiger 2006). In 2006, the species was discovered in several localities in Astrakhan and Saratov provinces and South Ural. The species is possibly widely distributed, but may also have been overlooked in the Lower Volga region. In 2009–2011, *C. expansa* was also discovered in several localities in the Ustyurt Plateau and the Emba River basin, western Kazakhstan (P. Gorbunov & K. Nupponen, unpublished).

***Caradrina inumbrata* (Staudinger, 1900)**

Guberlja Spring 7.ix.2009 2♂, 8.ix.2009 2♂

Remarks. *C. inumbrata* was recently reported as new to Europe (Hacker 2004; Nupponen & Fibiger 2006). The present records confirm that the species is resident in the southern Ural area.

***Scythocentropus misella* (Püngeler, 1908)**

Bogdo 26.viii.2006 about 100 exx

Remarks. *S. misella* was abundant on xerothermic and rocky southern slopes of the famous Bogdo Hill (Fig. 1). However, we did not record the species anywhere in adjacent areas in Astrakhan oblast, despite collecting several nights in very good weather conditions.

***Chloantha hyperici* ([Denis & Schiffermüller], 1775)**

Olhovka 18.v.2005 3♂

***Oxytrypia orbiculosa* (Esper, [1799])**

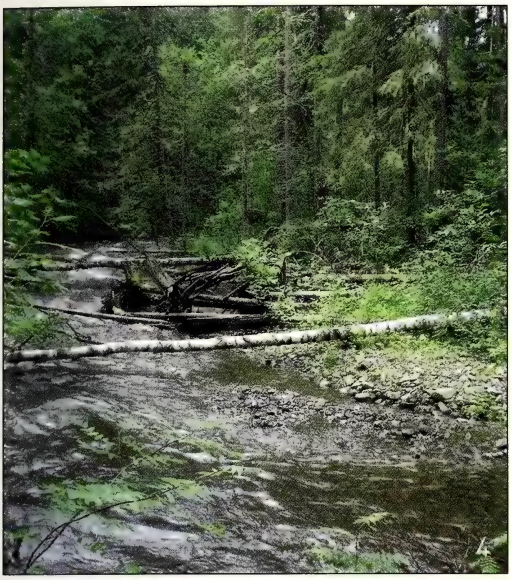
Chalk Hills 6–9.x.2007 2♂; Kumak River 10.ix.2009 1♂

***Mesapamea moderata* (Eversmann, 1843)**

Burannoe 19.viii.2006 1♀; Olhovka 4.ix.2002 1♀, 6.ix.2002 1♀, 7.ix.2002 1♀

***Luperina taurica* (Kljutschko, 1967)**

Bogdo 28.viii.2006 1♂ (GP 5578 MF); Olhovka 25.viii.2006 1♂; Peski Tshikili 30.viii.2006 1♂



Figs 4, 5. Taiga forest at the northern slope of Denetshkin Kamen, North Ural. Habitat of *Borearctia menetriesii*, *Xestia albonigra*, and *Xestia subgrisea* (Photo: K. Nupponen).

Remarks. The species occurs in the southernmost provinces of southwestern Russia (Matov et al. 2008). The present records are the northernmost ones known. New to Astrakhan and Volgograd oblasts. The habitats of *L. taurica* in the Lower Volga region are desert steppes (Fig. 1).

Fabula zollikoferi (Freyer, 1836)

Guberlja Spring 7.ix.2009 1♀, 8.ix.2009 1♂, 1♀; Kamenka 12.ix.2009 1♀; Kumak River 10.ix.2009 3♀, 11.ix.2009 5♂, 8♀

Remarks. In September 2009, the first author was studying the bionomics of *F. zollikoferi* in new localities in the southern Ural region. The species was discovered in three different localities, all of them being wetlands on the riverside or moist patches in steppes, with plenty of *Phragmites australis* and surrounded by large steppes (Figs 7, 8). As the species was recorded in all habitats where *Phragmites* was growing, but nowhere else, it seems clear that the species is breeding in such moist areas in steppe belt of the southern Urals. Further records of *F. zollikoferi* from western Kazakhstan in September, 2010 support this conclusion as well (K. Nupponen & P. Gorbunov, unpublished). *F. zollikoferi* was recently reared on stems of *Phragmites* (Ahola & Silvonen 2011), which is probably the main host plant in nature. As the larva lives in the stem, at least in its early stages, the species seems to prefer localities where stems of *Phragmites* are thick and do not grow in the water, as they are in all the three localities mentioned above and in the other two localities where the species is known to occur in the southern Urals (see Nupponen & Fibiger 2002, 2006). The moth is a strong flyer. The flight continues over the night, with a peak around midnight. The behaviour of the moth is quite peculiar. After landing – usually far from the light, it typically stays there

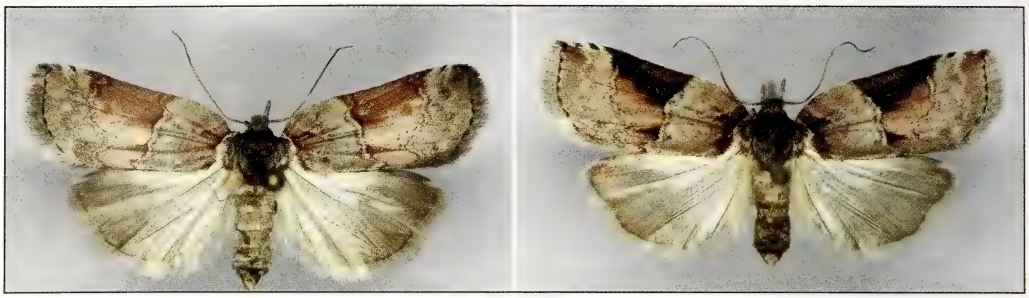


Fig. 6. Different forms (females) of *Nycteola eremostola* Dufay, 1961; South Ural, Schibendy Valley, 23.vi. 1999, K. Nupponen leg.

or sometimes jumps once or twice before staying, and becomes active again just before sunrise, and then hides during the day. Such type of behaviour evidently decreases the probability of capturing the species in light traps.

The expected imaginal summer diapause (Nupponen & Fibiger 2002; Zilli et al. 2005) is not confirmed, as suitable habitats have not been investigated in the first part of the summer. However, the story in Zilli et al. (2005, p. 81) is incomplete. In the River Ajat, three specimens of *zollikoferi* were collected in early July 1997. In late July 1998, the species was not recorded there, despite very good weather conditions. However, the same locality was visited again during the 'normal' flight period of *zollikoferi* in September 2000, and 11 specimens were collected during two nights. It is hard to believe that it happened just by chance, particularly because there were no signs of migration in any of the three visits. In May 2011, one female specimen of *F. zollikoferi* was collected in southwestern Kazakhstan (Bostankum sands, 25.v.2011, K. Nupponen & P. Gorbunov leg.). It is the first spring record of the species, and supports the hypothesis of imaginal aestivation.

The species shows remarkable individual variation in the colour of the forewing (Zilli et al. 2005). However, mottled specimens appear to be very rare at least in the Urals. During fourteen years, a total of 37 specimens were collected, and only four of them belong to f. *internigrata*, while 33 specimens are pale and rather unicolorous, showing only minor variation.

Sidemia spilogramma (Rambur, 1871)

Bannovka 31.viii.2006 1♀; Chalk Hills 22.viii.2006 1♂; Kumak River 10.ix.2009 1♀, 11.ix.2009 4♂, 3♀; Pugatsev 2.ix.2002 1♀; Sorochinsk 23.viii.2006 1♂

Remarks. The habitat of *S. spilogramma* by the River Kumak is illustrated in Fig. 8.

* *Amphipoea crinanensis* (Burrows, 1908)

Moskovo 16.vii.2007 1♂; Uchaly 4.ix.2009 2♂

Remarks. The species has been reported from the western part of European Russia (Matov et al. 2008). The species was also found in Mary El republic and mid Volga region (K. Mikkola, pers. comm.), Petersen (1914) presented distributional range of

the species to Baikal and Tian-Shan, Guylai & Ronkay noted it from West Siberia, but these records require confirmation. New to the Ural region.

***Hydraecia osseola* (Staudinger, 1882)**

Ilovla 5.ix.2002 1♀; Kumak River 10.ix.2009 1♀; Olhovka 6.ix.2002 2♀; Pugatsev 2.ix.2002 3♂; 1.ix.2006 1♀

***Gortyna cervago* Eversmann, 1844**

Chalk Hills 5–9.x.2007 4 exx; Guberlja 9.ix.2009 1♂, 1♀; Guberlja Spring 8.ix.2009 1♀; Kamenka 12.ix.2009 4♂, 1♀; Kumak River 10–11.ix.2009 6♂, 4♀, 14.ix.2010 4♂

*** *Chortodes brevilinea* (Fenn, 1864)**

Verbljushka 22.viii.2007 1♀ (P. Gorbunov leg.)

*** *Phragmatiphila nexa* (Hübner, 1808)**

Guberlja Spring 7.ix.2009 1♀

Remarks. A western European species. Earlier records in Russia are restricted to the westernmost provinces (Matov et al. 2008). The present record is the easternmost one known. New to the Ural region.

***Sedina buettneri* (E. Hering, 1858)**

Guberlja Spring 7.ix.2009 1♂; Kamenka 12.ix.2009 2♀; Kumak River 10.ix.2009 1♀, 11.ix.2009 1♀

***Leucochlaena fallax* (Staudinger, 1870)**

Chalk Hills 22.viii.2006 1♂; Verbljushka 22.viii.2007 1♀ (P. Gorbunov leg.)

***Brachylomia uralensis* (Warren, 1910)**

Kumak River 10–11.ix.2009 about 80 exx

Remarks. The habitat of *B. uralensis* by the River Kumak is illustrated in Fig. 8.

*** *Conistra erythrocephala* (Denis & Schiffermüller, 1775)**

Chalk Hills 5–9.x.2007 18 exx; Orenburg 4.x.2007 1 ex; Verbljushka 3.x.2007 5 exx

***Lithophane ornitopus* (Hufnagel, 1766)**

Chalk Hills 7.x.2007 1♀; Orenburg SW 4.x.2007 1♀; Pugatsev N 01.ix.2006 2♂

***Pseudohadena arenacea* L. Ronkay, Varga & Fabian, 1995**

Kumak River 11.ix.2009 1♂, 6.ix.2011 1♂

Remarks. *P. arenacea* was recently reported as new to Europe (Nupponen & Fibiger 2006). The present records confirm that the species is resident in the southern Ural area. In 2009–2011, *P. arenacea* was also discovered in the Ustyurt Plateau and Emba River basin, western Kazakhstan (P. Gorbunov & K. Nupponen, unpublished). The habitat of *P. arenacea* by the River Kumak is illustrated in Fig. 8.

Fig. 7. Guberlja Spring, South Ural: A moist patch with plenty of *Phragmites*, surrounded by steppe hills. Habitat of *Fabula zollikoferi* (Photo: K. Nupponen).

Pseudohadena schlumbergeri Püngeler, 1905

Bogdo 4.vi.2001 1♂ (GP 4125 MF)

Remarks. The specimen is illustrated in Fibiger & Hacker (2007). The habitats of *P. schlumbergeri* are semideserts and desert steppes (Fig. 2). In W Kazakhstan the species appears to be associated with sandy localities (K. Nupponen & P. Gorbunov, unpublished). New to Russia.

Dasypolia timoi Fibiger & K. Nupponen, 2006

Chalk Hills 6.x.2007 1♂, 7.x.2007 5♂, 8.x.2007 8♂ 1♀, 9.x.2007 4♂, 10.x.2007 5♂

Remarks. In addition to the type series (2 exx; see Nupponen & Fibiger 2006) and the present topotypical material, the species is known by three old specimens from Karazhal, Karagandinskaja oblast, Central Kazakhstan (11.x.1937 2♀, 15.x.1937 1♂; coll ZISP). The adults and the genitalia of both sexes are illustrated in Fibiger et al. (2010: plate 15, figs 9, 10; genitalia figs 144, 319). The female genitalia in fig. 319 originate from a specimen from C Kazakhstan, not from South Ural.

* *Polymixis trisignata* (Ménétriés, 1847)

Kumar River 10.ix.2009 1♀, 11.ix.2009 2♂ 1♀

Remarks. The species is known from the South Urals by old records of Spuler (1908) from Orenburg and Zhuravlev (1910) from Uralsk (Kononenko 2005). The presence of the species in Ural is confirmed. In September 2011, several specimens of *P. trisig-*

Fig. 8. Steppe hills, rocky slopes and moist patches at sandy riverside by the River Kumak, South Ural. Habitat of *Fabula zollikoferi*, *Pseudohadena arenacea*, *Sidemia spilogramma*, *Brachylomia uralensis*, *Polymixis trisignata*, and *Nycteola eremostola* (Photo: K. Nupponen).

nata were collected in W Kazakhstan by Emba Village (K. Nupponen & P. Gorbunov, unpublished). The habitat of *P. trisignata* by the River Kumak is illustrated in Fig. 8.

Polymixis rosinae (Bohatsch, 1907)

Chalk Hills 5.x.2007 3♂, 6.x.2007 1♂, 7.x.2007 3♂ 1♀, 8.x.2007 1♂, 9.x.2007 1♂

Polymixis atossa (Wiltshire, 1941)

Chalk Hills 5.x.2007 1♂, 6.x.2007 3♂ 3♀, 7.x.2007 2♂

Orthosia ella (Butler, 1878)

Moskovo 2.vi.2004 1♀

Remarks. Previous records of the species from the Urals are from the 1930s (Nupponen & Fibiger 2006; Fibiger et al. 2010).

Saragossa siccanorum (Staudinger, 1870)

Bogdo 26–28.viii.2006; Burannoe 18–19.viii.2006; Chalk Hills 20–22.viii.2006; Peski Thikili 30.viii.2006; Sasykoli 29.viii.2006. Common.

Mythimna alopecuri (Boisduval, 1840)

Frolovo 16–17.v.2005 20 exx; Olhovka 3–4.ix.2002 2♂ 1♀, 15.v.2005 4♂, 18.v.2005 44 exx

Dichagyris latipennis (Püngeler, 1909)

Fig. 9. Rocky mountain tundra at upper slopes of Denetshkin Kamen, North Ural. Habitat of *Agrotis ruta* (Photo: K. Nupponen).

Sasykoli 29.viii.2006 3♂ 1♀ (Fig. 3)

Distribution. C and E Turkey, Russian Turkestan.
Remarks. Two of the European specimens are illustrated in Fibiger et al. (2010: plate 11, figs 50, 52). The habitat in Astrakhan oblast is a sandy desert with *Calligonum* and various Poaceae as dominant plants (Fig. 3). New to Russia and Europe.

Dichagyris orientis (Alphéraky, 1882)

Bogdo 3.vi.2001 1♀, 4.vi.2001 1♀; Kizilskoye 30.v.2007 1♂ (P. Gorbunov leg.)

* *Euxoa deserta* (Staudinger, 1870)

Bogdo 26.viii.2006 3♂; Chalk Hills 22.viii.2006 1♂; Olhovka 7.ix.2002 1♂; Peski Tshikili 30.viii.2006 2♂

Remarks. The species inhabits semideserts and desert steppes in the Volgo-Ural region (Fig. 2). Population densities seem to be relatively low throughout its distribution.

Euxoa fallax (Eversmann, 1854)

Bogdo 27.viii.2006 1♂, 28.viii.2006 1♂

Remarks. The species inhabits semideserts and desert steppes in Astrakhan oblast (Fig. 2).

Euxoa dsheiron Brandt, 1938

Chalk Hills 22.viii.2006 1♂; Verbljushka 5–6.ix.2009 about 50 exx

***Agrotis characteristica* Alphéraky, 1892**

Chalk Hills 20–22.viii.2006 about 40 exx; Guberlja Spring 7.ix.2009 1♂; Verbljushka 22.viii.2007 1♀ (P. Gorbunov leg.)

***Agrotis ruta* (Eversmann, 1851)**

North Ural, 60°24–26'N 59°29–36'E, 1000–1250 m, Denetshkin Kamen, mountain tundra, 12.vii.2007 1 pupa, a male emerged 16.vii.2007

Remarks. The specimen is illustrated in Fibiger et al. (2010: pl. 10, fig. 8). The specimens from northern Ural and Siberia are similar in the external appearance. The habitat of *A. ruta* in northern Ural is mountain tundra, and the species prefers xerotermic gravelly patches (Fig. 9). In the isolated mountain tundra region of the southern Urals, *A. ruta* is replaced by its sister species *A. iremeli* K. Nupponen, Ahola & Kullberg, 2001, which is a southern Uralian endemic. For further notes on *A. iremeli*, see Nupponen et al. (2001), Nupponen & Fibiger (2002) and Fibiger et al. (2010).

* ***Agrotis clavis* (Hufnagel, 1766)**

Tavatui 1–7.viii.2006 1♀ (V. Olschwang leg.)

Remarks. This is the first confirmed record of *A. clavis* in the Urals. The species is often confused with a closely related *A. frater* Fibiger, Ahola & K. Nupponen, 2006, which is not rare in steppe regions of the southern Urals. The study of the distribution of this pair of species in Asia is highly desirable.

* ***Pseudohermonassa melancholica* (Lederer, 1853)**

Ekaterinburg 30.VII–11.viii.2005 1♂; Moskovo 4.viii.2000 1♂ (T. Nupponen leg.), 16.viii.2006 5♂, 16.vii.2007 1♂, 17.vii.2007 2♂

Distribution. Widely distributed in the Asian part of Russia, from western Siberia to the Far East.
Remarks. The western boundary of this species distribution is in the Urals. New to Europe. One of the specimens from southern Ural is illustrated in Fibiger et al. (2010): pl. 12, fig. 43; due to transition of rows, the collecting data of the specimen are presented in fig. 44 in the illustration text (p. 300).

* ***Spaelotis deplorata* (Staudinger, 1897)**

Moskovo 16.vii.2007 1♀ (Genitalia slide: K. Nupponen prep. no. 2/24.i.2010).

Remarks. Earlier reports of *S. deplotata* in Europe are based on misidentifications (Fibiger 1993; Nupponen & Fibiger 2002; Fibiger & Hacker 2005). New to Europe. The specimen from southern Ural is illustrated in Fibiger et al. (2010: pl. 12, fig. 48); due to transition of rows, the collecting data of the specimen are presented in fig. 49 in the illustration text (p. 300).

***Graphipora augur* (Fabricius, 1775)**

Iremel 19.vii.2007 1♂; Miass 16–19.vii.2007 1♂

Fig. 10. *Xestia albonigra* (Kononenko, 1981); North Ural, Denetshkin Kamen, (N slope) 11.vii.2007, K. Nupponen leg.

Xestia sareptana (Herrich-Schäffer, 1851)

Olhovka 3.ix.2002 1♀, 4.ix.2002 2♂ 2♀, 6.ix.2002 1♂ 1♀, 25.viii.2006 1♀

Remarks. The type locality of the species is Sarepta (Volgograd oblast). However, the present records are the first ones from the region since the beginning of the 1900s. The habitat is a luxuriant, bushy area between calcareous hills and moist meadows. One of the specimens from Olhovka is illustrated in Fibiger et al. (2010: pl. 12, fig. 50); due to transition of rows, the collecting data of the specimen are presented in fig. 51 in the illustration text (p. 300).

Xestia trifida (Fischer v. Waldheim, 1820)

Bannovka 31.viii.2006 about 70 exx; Olhovka 7.ix.2002 10♂; Pugatsev 1.ix.2006 1♂

Remarks. Locally the species is not rare in the Lower Volga region. The northern boundary of its distribution is in the Middle Volga, and the species has never been recorded in the southern Urals.

Xestia subgrisea (Staudinger, 1897)

North Ural, 60°28'N 59°40'E, 260 m, Denetshkin Kamen (N slope) 13.vii.2007 1♂

Remarks. The specimen is illustrated in Fibiger et al. (2010: pl. 13, fig. 10). The habitat is a taiga forest (Figs 4, 5).

***Xestia kollari* (Lederer, 1853)**

Moskovo 16.vii.2007 1♂

***Xestia laetabilis* (Zetterstedt, [1839])**

North Ural, 60°28'N 59°40'E, 260 m, Denetshkin Kamen (N slope) 12.vii.2007 1♂

***Xestia albonigra* (Kononenko, 1981)**

North Ural, 60°28'N 59°40'E, 260 m, Denetshkin Kamen (N slope) 11.vii.2007 1♂

Distribution. Baikal region, Far East (Amur, Khabarovsk and Primoriye territories), Sakhalin, N Korea, N China (Kononenko 2005); Krasnoyarsk terr. (Kononenko, pers. comm.).

Remarks. This eastern Palaearctic species was surprisingly found in North Ural, about 3000 km to the west from nearest known records. The habitat is a taiga forest (Figs 4, 5). New to Europe. The specimen from North Ural (Fig. 10) is illustrated in Fibiger et al. (2010: pl.13, fig. 11); due to transition of rows, the collecting data of the specimen are presented in fig. 15 in the illustration text (p. 302).

***Xestia sincera* (Herrich-Schäffer, 1851)**

Iremel 18.vii.2007 1♀

Discussion

During 2006–2010, fourteen additional species of Bombycoidea and Noctuoidea were recorded for the southern Ural Mountains. The fauna of the southern Urals is moderately well known, and differs significantly from that of the Lower Volga region. The distributions of many species occurring in southern semideserts reach the Lower Volga region and the vicinity of Volgograd (formerly known as Sarepta) in the north, but not the southern Urals.

The Lepidoptera fauna in the northern half of the Ural Mountains is poorly known. It is difficult to reach collecting localities in the region, because roads are mainly in a bad condition or even absent, and it is not so easy to walk kilometers in virgin taiga forests. However, the distributions of several taiga species, to date considered to be restricted to the Eastern Palaearctic region, extend westwards to the Urals along the Siberian taiga and arctic tundra regions. *Pararctia tundrana*, *Xestia albonigra*, and a geometrid moth *Leucobrephos middendorfi* (Ménétriés, 1858) are good examples of such species.

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Checklist of Butterflies (Papilionoidea) of the Mongolian Altai Mountains, including descriptions of new taxa

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Abstract. A checklist of Papilionoidea of the Mongolian Altai is presented. Several new taxa (*Neolycaena sapozhnikovi* **sp. n.**, *Plebejus germani* **sp. n.**, *P. anikini* **sp. n.**, *P. idas shadzgat* **ssp. n.**, *Erebia przhevalskii* **sp. n.**, *E. chastilovi nomada* **ssp. n.**, *Hyponephele lycaon dmitrievae* **ssp. n.**, and *H. lycaon kerzhneri* **ssp. n.**) are described. Zoogeographical demarcation of the Mongolian Altai (within the limits of Mongolia) is presented.

Introduction

The Mongolian Altai is a mountain system in Mongolia and China. It stretches approximately 1000 km from the northwest to the southeast and its width varies from 300 km in the northwest to 150 km in the southeast. It reaches altitude of 4362 m (Mt. Munkh-Khajrkhan-Ula) and consists of several parallel ridges, separated by longitudinal tectonic valleys. The summits are mostly plateau-like, with cirque and cornice glaciers (the largest one being Potanin Glacier) on their crests. The Mongolian Altai is made up of Palaeozoic schists, porphyries, and granites. Southwestern slopes receive more precipitation than the northeastern ones, and they consist of richer forest-meadow landscapes (with spruce and larch prevailing in forests), changing into steppes in lowlands and alpine meadows. Steppes and semi-deserts dominate on northeastern slopes, while semi-deserts prevail between the Mountains The mountain system of the Mongolian Altai reaches the uplands of the Altai Republic (Russia) in the north, borders with deserts and semi-deserts of Dzhungaria and Gobi towards south and west, and semi-deserts of the Great Lakes Depression in the northeastern area of the system. The Alag-Nuur Depression in the east of the Mongolian Altai separates it from the lower Gobi Altai (Kamelin 2005).

The history of the study of butterflies from the Mongolian Altai

The study of butterflies of the Mongolian Altai is relatively recent. First specimens were collected in the Mongolian Altai by a professor of the Tomsk University, Vasilij V. Sapozhnikov [W. Sapojnikof] (from December 9 (December 21), 1861 to August 11, 1924) (Fig. 1). This outstanding Russian geographer was an enthusiastic collector of plants and insects in the southeastern Russian Altai, Western Mongolia, and northwestern China [1]. Based on fieldwork data, the excellently written monograph (1911) was pub-

Fig. 1. Prof. V.V. Sapozhkinov [W.W. Sapojnikof] (1861–1924).

lished with rather short notes on the Lepidoptera collected by him. V. V. Sapozhnikov has the undoubted credit in entomology of being the first to collect the extended material from various regions of the Mongolian Altai including its Chinese area. The material was processed by A. A. Meinhard (1910a, b), an entomologist at the Tomsk University. Appendices and descriptions of some new forms were added by W. Wnukowsky (1927, 1929, 1930).

In 1960–70s Soviet, Hungarian, and German entomologists were actively researching the territory of Mongolia, but Mongolian Altai remained relatively unexplored. Some butterflies were collected by Hungarian entomologists working under Dr. Z. Kaszab and described in a number of publications (Forster 1965, 1967, 1968, 1972; Balint 1987, 1988a, b, 1989a, b, 1990, 1996; Balint et al. 2006). Russian and German scientists presented their findings in several articles (Korshunov & Soljanikov 1976; Korshunov 1977; Grosser 1981). Dr. Izyaslav M. Kerzhner, a Russian entomologist, also collected some butterflies in the Mongolian Altai. Hungarian specialists continued their reseach on the territory of Western Mongolia; the article describing findings from their last expedition was published by Bálint et al. (2006).

Three professional entomologists (Dr. Petr Ustjuzhanin, Dr. Vasilij Kovtunovich, and myself) and one amateur (Nikolaj Zhigulin) made a short expedition to the Mongolian Altai in 1999. Despite demanding working conditions, a new species of Lycaenidae was found and described in 2001 (Zhdanko & Jakovlev 2001). Later the research continued, mostly through joint botanical-zoological expeditions, organized by the South Siberian Botanical Garden of the Altai University. During the next seven expeditions, I worked together with entomologists Prof. V. Anikin, Dr. E. Guskova, and V. Doroshkin. Expeditions were held in all three aimaks (provinces) where the mountain system is situated: Ulegei (Bayan-Ulegei), Hovd, and Gobi-Altai aimaks, as well as in some localities never before explored by entomologists. Material from these expeditions and museum data provided the basis for a number of publications (Yakovlev 2002, 2003a, b, c, 2004, 2006, 2007a, b; Dubatolov et al. 2005; Kolesnichenko 2005; Yakovlev et al. 2005, 2006, 2009).

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[1] V. V. Sapozhnikov visited the Mongolian Altai in 1905, 1906, 1908 and 1909. On June 26, 1905 he was the first to cross the Mongolian border. For four years he had been studying the geography and biota of the Mongolian Altai. Dozens of glaciers were found, mountain ranges and the river network of Western Mongolia were described, Mongolian vegetation was carefully studied, and many herbarium specimens and zoological collections were made. It is noteworthy that V. V. Sapozhnikov managed to combine his work as a rector of the Tomsk University, his scientific activity, and his fieldwork, all at the same time.

Japanese entomologists also collected in the region (Yazaki 2000, 2001, 2002, 2004; Suwa et al. 2008) and described a significant new species, *Erebia tsengelensis* Suwa et al., 2008. In the Chinese part of the Mongolian Altai only limited research has taken place (Huang & Murayama 1992).

At the same time Sergej Churkin (Russia) was involved in three longterm expeditions across Mongolia and spent most of the time in the Mongolian and Gobi Altai. The material he collected enabled description of many new taxa and provided interesting data on distribution, systematics and biology of butterflies. These data were presented in a series of publications (Churkin 2003a, b, c, d, 2004a, b, c, d, e, 2005a, b, c, d, 2006; Churkin & Bogdanov 2003; Churkin & Kolesnichenko 2003a, b, 2005a, b; Churkin & Tuzov 2005; Churkin & Zhdanko 2003; Dantchenko & Churkin 2003). Churkin and myself also published several articles on butterfly systematics (Churkin & Yakovlev 2005a, b, 2006; Churkin et al. 2004; Yakovlev & Churkin 2003). After all this material was processed, the number of known butterfly species for the Mongolian Altai rose by nearly 40%, and some species new to science were discovered.

An important moment for the study of butterflies of Mongolia was the publication of the book 'Butterflies of Mongolia' (Tshikolovets et al. 2009). The cooperation of book's co-authors resolved many problems concerning faunistic data and taxonomy, but some remained, and in this paper I resolve some of them.

Material

I collected over 15,000 butterfly specimens during numerous expeditions to different regions of Western Mongolia in the last 11 years (Fig. 2). Specimens from several private and state collections in Russia, Ukraine, Hungary, and Germany were also studied. In the species list months in which the insect was recorded on the wing are represented by Roman numerals.

Abbreviations

LT Locus typicus
RYB Roman Yakovlev (Barnaul, Russia)
ZISP Zoological Institute of Russian Academy of Science (St. Petersburg, Russia)

Zoogeographical demarcation of the Mongolian Altai (Mongolian part)

The Mongolian Altai is the southeastern part of the Altai mountain region. Orographic scheme is presented in Fig. 3. Relief elements 55–79 and 83 belong to the Mongolian Altai. Phytogeographic demarcation of the Altai Mountain region has already been described (Yakovlev 2003b, 2006). Lepidoptera of the southwestern (Dzungarian) slopes of Mongolian Altai are very different from those of the northeastern slopes. That has been documented in several publications (Sergeev 1986, Kryzhanovskij 2002).

The main ridge of the Mongolian Altai divides the biota of the Altai mountain region into two biological provinces: Altai-Dzugarian (western) and Western Mongolian (eastern). Zoogeographical structure of the Mongolian Altai could not be subdivided

Fig. 2. Collecting localities by author in the Mongolian Altai.

more precisely until recently because of insufficient data. A tentative opinion on the zoogeographical structure of Mongolian Altai based on its butterfly fauna is provided in Fig. 4.

Eastern slopes of the Mongolian Altai are very dry and cold in its northern part, and hot and dry to the south of the Great Lakes Depression. Butterflies are scarce all along the ridge. That suggests that Western Mongolian province should be divided into two regions: Ulegei and Kobdo-Darvijn-Nuruu.

The fauna of the Ulegei region (Fig. 5) is similar to that of the well-studied Chuya Valley in the southeast of the Russian Altai. The well-known Altaian mountain-steppe and tundra species *Colias mongola* Alphéraky (Pieridae), *Coenonympha amaryllis* (Stoll), *Boeberia parmenio* (Boeber), *Pseudochazara pallida* (Staudinger) (Nymphalidae) including the Mongolian endemics *Erebia tsengelensis*, *E. przhevalskii* **sp. n.**, *Melitaea didymina* (Staudinger) (Nymphalidae) occur in the region.

Kobdo-Darvijn-Nuruu region, on the other hand, is mostly inhabited with desert and semi-desert species: *Neolycaena davidi namkhaidorzhi* Churkin, 2004, *Tongeia bisudu* Zhdanko & Jakovlev, *Aricia chinensis* (Murray), *Plebejus argyrognomon anceps* Churkin, and *Centrarctia mongolica* (Alphéraky) (Erebidae: Arctiinae).

According to data on Lepidoptera (Yakovlev 2003b), the South Mongolian Province of the Altai Mountain Country (I-3 in Fig. 4) (Fig. 6), established by R. V. Kamelin, hardly deserves to be considered as a different region. Its fauna is not very different from that of the region westward from the Mongolian Altai and is more related to the fauna of the Altai-Dzugarian region. Common to them are such narrowly distributed species as *Neolycaena musa* Zhdanko & Jakovlev (Lycaenidae) and *Gobibatyr ustyuzhanini* Yakovlev (Cossidae). Isolation is reduced because of the lower altitudes of the main ridges (it decreases the isolating capacity of southern spurs in the Mountain Altai). The region is surely isolated but its fauna can be described as belonging to a larger biogeographical subregion included in the Western Mongolian province of the Altai Mountain Country. Highlands of the central Gobi-Altai aimak, for example the Khan-Tajshiryn-Nuruu Mountains, the Khara-Adzgarajtyn-Nuruu Mountains, and the Khasagt-Khairkhan Mountains (the main regional ridges), are rather unique and have been well studied (Churkin 2003a, b; Yakovlev 2006, 2007). Several endemic forms were described from there (*Oeneis temujin* Churkin, *Erebia chastilovi* Churkin, *Agrodiaetus mediator* Dantchenko & Churkin, *Agriades glandon ustyuzhanini* Yakovlev & Churkin). The lowland fauna of this region is generally not very specific and it is similar to the fauna of the southern slopes of Khangai and desert regions eastwards and southwards from the Mongolian Altai. For instance, *Polyommatus kashgharensis szabokyi* Balint (Lycaenidae) is common there. Isolated and poorly studied highlands Adzh-Bogdo (Fig. 7) in spite of great expectations, the

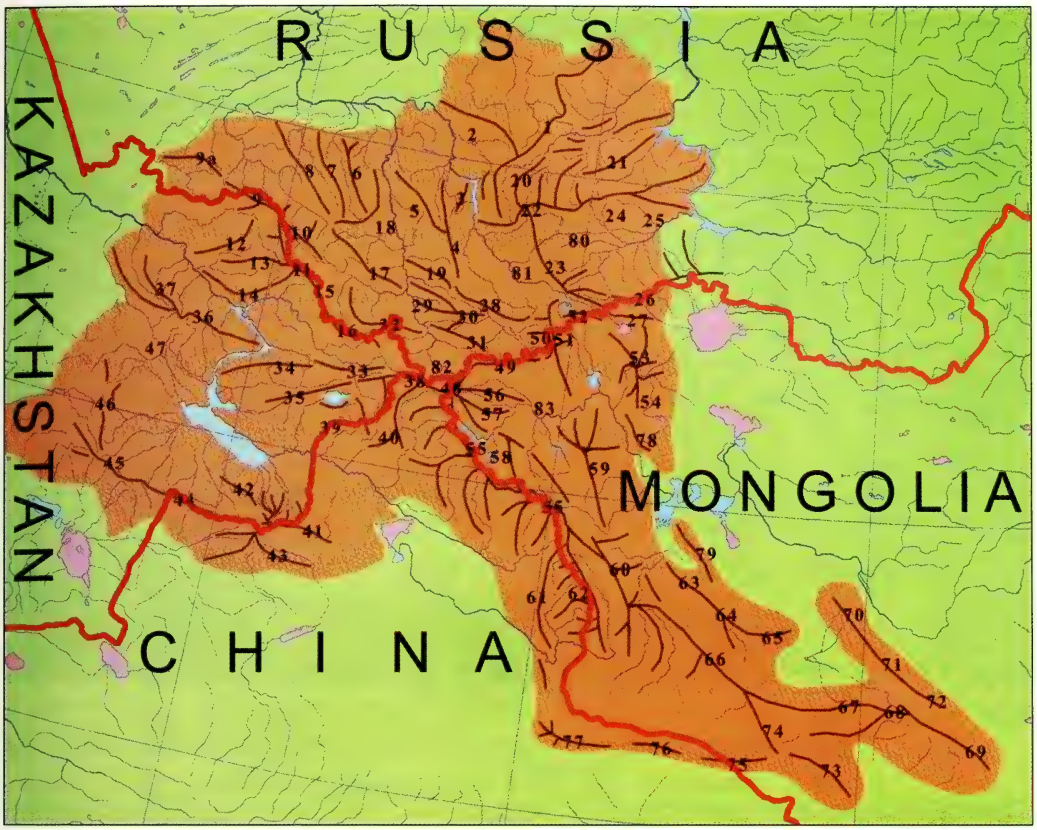

Fig. 3. Orography of Altai Mountain Country (by R.V. Kamelin). Ridges: **1**: Abakanskij; **2**: Bijskaya Griva; **3**: Altyn-Tau; **4**: Sumul'tinkij; **5**: Iolgo; **6**: Cherginskij; **7**: Anujskij; **8**: Baschelakskij; **9**: Tigirezkij; **9a**: Kolyvanskij Kryazh; **10**: Korgonskij; **11**: Koksujskij; **12**: Ubinskij; **13**: Ivanovskij; **14**: Ul'binskij; **15**: Kholzun; **16**: Listvyaga; **17**: Terektinskij; **18**: Seminskij; **19**: Ajgulakskij; **20**: Karlygan; **21**: Dzhebashskij; **22**: Saldzhur; **23**: Shapshal'skij; **24**: Sayanskij; **25**: Khemchiksij; **26**: Western Tannu-Ola; **27**: Tsagan-Shibetu; **28**: Kurajskij; **29**: Shavlinskij; **30**: Northern-Tchuya Alps; **31**: Southern-Tchuya Alps; **32**: Katunskij; **33**: Sarymsakty (including small Tarbagataj); **34**: Narymskij; **35**: Kurchumskij; **36**: Kalbinskij; **37**: Airtau; **38**: Southern Altai; **39**: Asutau; **40**: Kabinskij; **41**: Saur; **42**: Monrak; **43**: Semistaj; **44**: Tarbagataj; **45**: Okpekty; **46**: Zharminsko-Ayaguzskij; **47**: Verkhnecharskij; **48**: Tabyn-Bogdo-Ula; **49**: Sajlyugem; **50**: Talduair; **51**: Chikhacheva; **52**: Mongun-Taiga; **53**: Turgen-Ula; **54**: Kharkhiraa; **55**: Mongolian Altai (general); **56**: Bayan-Ula; **57**: Kujten-Ula; **58**: Tsengel-Ula; **59**: Zast-Ula; **60**: Munkh-Kairkhan; **61**: Chingil'skij; **62**: Bulugunskij; **63**: Batar-Khairkhan; **64**: Sutaj-Ula; **65**: Darvijn-Nura; **66**: Alag-Khairkhan; **67**: Uirten-Khuren-Ula; **68**: Burkhan-Budaj-Ula; **69**: Gichigenijn-Nuru; **70**: Khasagt-Khairkhan; **71**: Khan-Tajshiryn-Nuru; **72**: Sarkh-Ula; **73**: Adzh-Bogdo; **74**: Alag-Nuru; **75**: Takhijn-Shar-Nuruu; **76**: Khavatijn-Nuruu; **77**: Bajtag-Bogdo; **78**: Altan-Khukhijn; **79**: Bumbat-Ula; Plateaus: **80**: Alashskoe; **81**: Chulyshmanskoe; **82**: Ukok; **83**: Ulgijskoe.

fauna was impoverished, with components typical for the southeastern Mongolian Altai. Endemics have not been detected there. Most likely many species of Siberian Lepidoptera are likely to find their distribution limit in the Khara-Adzgarajtyn-Nuruu and Khasgt-Khirkhan Mountains, with data on Cossidae, Noctuidae and butterflies supporting this (Churkin 2003b, 2005d; Yakovlev 2004; Volynkin pers. comm.). For example, the southeastern (for mountains of Altai) distribution limit for *Larix sibirica* Ledebour, 1833 is in this region as well. The Alag-Khairkhan Mountains should be considered as the eastern border of the region.

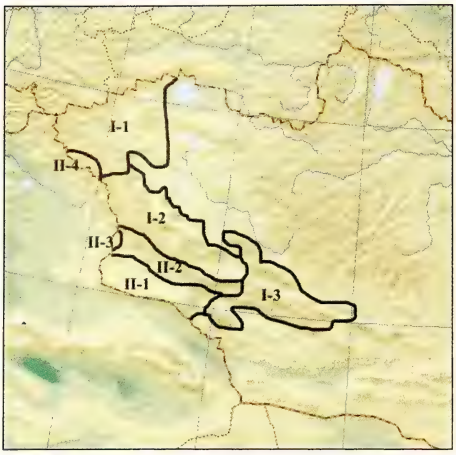

Fig. 4. Zoogeographical demarcation of the Mongolian Altai (within the limits of Mongolia).

It appears that the entomofauna of the southwestern slope of the Mongolian Altai is more variable. Fieldwork in this region is subject to a number of difficulties, not least of which is that most of the western prongs of the Mogolian Altai are inaccessible to many entomologists as they are within Chinese territory. The Mongolian part is very small and almost completely restricted to the frontier zone.

The idea of the western part of the Mongolian Altai as very dry Dzungaria (Sergeev 1986; Kamelin 2005) with a large number of songorian and eastern Palaearctic faunistic elements seems to be partially true and can be applied to Barun-Khuraj Depression, Adzh-Bogdo lowlands, and mountain massifs of the main divided ridge of the Mongolian Altai facing the Dzungarian and Transaltaian Gobi. These regions are rather poor faunistically, although they are very unique, taking into account the desert element of western Palaearctic and middle Asian origin.

The river valleys of the Uenchin-Gol, the Bodonchin-Gol and, in particular, the Bulugun (Bulgan-Gol) from their upper reaches to their middle course reveal a unique fauna complex with western Palaearctic species prevailing (Yakovlev 2003b, 2006); however, many species of Siberian origin occur as well (Tshikolovets et al. 2009), especially in the upper reaches of eastern tributaries of the Bulugun. In the highlands and uplands of Shadzgat-Nuruu Mountains, as well as in the upper reaches of the River Ulyastain-Gol, the fauna is mainly Siberian, almost identical on the subspecific level (Tshikolovets et al. 2009). A similar situation occurs in the valley of the River Bidzhijn-Gol (Tshikolovets et al. 2009).

One of the well-studied massifs is the Arshantyn-Nuruu Mountains, located to the southwest of the small western tributary of the Bulugun, the Bayan-Gol River. The unique entomofauna is strongly correlated with the singularity of the flora. Several endemics of this interesting massif were described: *Pseudophilotes svetlana* Yakovlev, *Tongeia arata* Yakovlev, *Neolycaena sapozhnikovi* **sp. n.** (Lycaenidae), *Melitaea yakovlevi* Kolesnichenko, *M. elena* Yakovlev (Nymphalidae), as well as many of the original western Palaearctic elements such as *Gobibatyr colossus* (Staudinger) (Cossidae), *Hemaris ducalis* (Staudinger) (Sphingidae), *Carcharodus flocciferus* (Zeller) and *Muschampia antonia* (Speyer) (Hesperiidae), *Arethusana arethusa* (Dennis & Schiffermüller) and *Chazara enervata* (Staudinger) (Nymphalidae), and *Agrodiaetus rippartii* (Freyer) (Lycaenidae) (Yakovlev 2002, 2007c; Yakovlev & Doroshkin 2004; Yakovlev et al. 2005; Tshikolovets et al. 2009).

Another similar 'oasis' on the western slope of the Mongolian Altai (within Outer Mongolia) is the Elt-Gol river valley (southwest of the Bayan-Ulegei aimak), which is one of the Black Irtysh head rivers, as distinct from the huge closed water bodies of

Fig. 5. Ulegei region, Bayan-Ulegei aimak, Durbet-Daba pass, 2650 m, June 2009 (photo by R. Yakovlev).

Outer Mongolia. The explored territory surely belongs to the so-called 'damp Altai'. With its landscapes it resembles separate regions of the Central (Chuy Alps, etc.) and Chinese Altai. The analyses of collected entomological and botanic materials (Kamelin 2006, Yakovlev & Doroshkin 2006) indicate a great faunstic similarity with the Central and, probably, Chinese Altai. It is of interest that a number of species of Siberian and western Palaearctic faunas in the territory of the region (most probably in some areas of the Chinese Altai) are represented by clearly differentiated subspecies (Yakovlev & Doroshkin 2006). In addition to typical 'Siberians' *Erebia theano* (Tauscher), *E. jeniseiensis* Trybom, *Oeneis magna* Graeser, *Boloria altaica* (Grum-Grshimailo), *B. frigidalis* Warren, *Melitaea latonigena* Eversmann (Nymphalidae), *Pieris euorientis* Verity (Pieridae), etc., with unexpected species for the given faunistic complex such as *Colias erate* (Esper) (Pieridae) and *Polygonia interposita* (Staudinger) (Nymphalidae) were found (Gus'kova & Yakovlev 2011).

Therefore, western and southwestern slopes of the Mongolian Altai can be divided into four regions: 1. Barun-Khuraj – Adzh-Bogdo region (II-1 in Fig. 4) (Fig. 8); 2. Bulugun-Bidzhijn-Gol region (II-2 in Fig. 4) (Figs 9, 11); 3. Arshantyn region (II-3 in Fig. 4) (Fig. 10); 4. Kara-Irtysh region (II-4 in Fig. 4). The latter two probably extend into Chinese territory; however, it might be too early to discuss zoogeography (and even the checklist) of butterflies in the Chinese part of the Mogolian Altai). Besides, a series of large massifs are still poorly studied in the Mongolian part of the Mongolian Altai, e.g. Bajtag-Bogdo and some lower ridges to the east. Highlands of the Adzh-Bogdo Mountains are almost unknown. The general tendency of the butterfly fauna might be

Fig. 6. Southern-Mongolian region, Gobi-Altai aimak, Khasagt-Khairkhan Mountains, 2500 m, July 2010 (photo by V. Anikin).

Fig. 7. Southern-Mongolian region, Gobi-Altai aimak, Adzh-Bogdo Mountains, Il-gol Valley, 2800 m, July 2009 (photo by R. Yakovlev).

Fig. 8. Barun-Khurai-Adzh-Bogdo region, Khovd aimak, Dzhungarian Gobi, 15 km S of Bulgan, 1050 m, July 2007 (photo by V. Anikin).

Fig. 9. Bulugun-Bidzhijn-Gol region, Khovd aimak, Valley of Uenchin-Gol river, 1400 m, July 2005 (photo by D. Ryzhkov).

Fig. 10. Arshantynskij region, Khovd aimak, Bayan-Gol Valley, Arshantyn-Nuruu Mountains, 2100 m, June 2005 (photo by D. Ryzhkov).

lower richness in the highlands and uplands in southern and southeastern regions of the Mongolian Altai. For example, under similar conditions the Russian Altai (the Kurai Mountains) has three species of *Boloria* Moore, 1900 (one in the Khasagt-Khairkhan Mountains, Mongolian Altai), eight species of *Oeneis* (two in the Mongolian Altai), and seven species of *Parnassius* (one in the Mongolian Altai), etc. (Tshikolovets et al. 2009).

Annotated list of species (taxonomy by Korshunov 2002 and Tshikolovets et al. 2009) A species recorded as possible for the fauna of the Mongolian Altai is marked with *.

Family Hesperiidae Latreille, 1809

* *Erynnis tages* (Linnaeus, 1758)

Chuya valley in the Altai Republic (Russia) (Elwes 1899; Tshikolovets et al. 2009).

Spialia orbifer (Hübner, 1823)

Spialia orbifer ssp. *pseudolugens* P. Gorbunov, 1995.

Arshantyn-Nuruu Mountains, Valley of Bulgan-Gol River. vi–vii.

Spialia struvei (Püngeler, 1914)

Dzungarian Gobi desert in the southern parts of Hovd and Gobi-Altai aimaks (Dubatolov et al. 2005). Very rare. vi–vii.

Muschampia cribrellum (Eversmann, 1841)

Muschampia cribrellum ssp. *obscurior* (Staudinger, 1892)

Hovd (Kobdo) (Meinhard 1910) and Horgo-Nuur lake in the Bayan-Ulegei aimak (Yazaki 2004). vi–vii.

Muschampia tessellum (Hübner, 1803)

Muschampia tessellum ssp. *dilutior* (Rühl, 1895)

Munkh-Khairkhan Mt. in the Bayan-Ulegei aimak (Balint et al. 2006). vi–vii.

Muschampia protheon (Rambur, 1858)

Arshantyn-Nuruu Mountains and Valley of Bulgan-Gol river. Rare. vi–vii.

Muschampia staudingeri (Speyer, 1879)

Dzungarian Gobi desert (Uvkhod-Ula Mt.). Very rare. vi–vii.

Muschampia antonia (Rambur, 1858)

Arshantyn-Nuruu Mountains. Very rare. vi–vii.

Fig. 11. Bulugun-Bidzhijn-Gol region, Khovd aimak, Valley of Bulgan-Gol river, 1500 m, July 2005 (photo by D. Ryzhkov).

Pyrgus malvae (Linnaeus, 1758)

Elt-Gol Valley, Shadzgat-Nuruu Mountains. Rare. vi–vii.

Pyrgus alveus (Hübner, 1803)

Pyrgus alveus sifanicus (Grum-Grshimailo, 1891)

Arshantyn-Nuruu, Khasgt-Khirkhan Mountains. Common. vi–vii.

Pyrgus serratulae (Rambur, 1839)

Pyrgus serratulae uralensis (Warren, 1926)

Different parts of the Mongolian Altai. Common. v–vii.

* *Pyrgus sibirica* (Reverdin, 1911)

Very common in the Russian Altai, probably in highlands of the northern part of the Mongolian Altai. vi–vii.

Pyrgus centaureae (Rambur, 1839)

Elt-Gol Valley. Very rare. vii.

Carcharodus flocciferus (Zeller, 1847)

Arshantyn-Nuruu Mountains. Common. v–vii.

Carterocephalus palaemon (Pallas, 1771)

Carterocephalus palaemon albiguttata (Christoph, 1893)

Elt-Gol Valley. Very rare. vii.

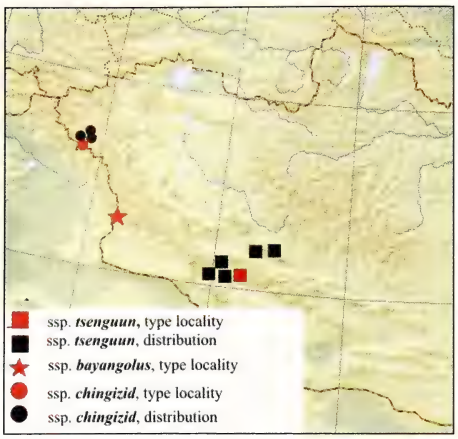

Fig. 12. Distribution of *Parnassius phoebus* in the Mongolian part of the Mongolian Altai.

Carterocephalus silvicola (Meigen, 1829)

Probably mistakenly recorded for Kobdo (Meinhard, 1910).

Carterocephalus argyrostigma (Eversmann, 1851)

Northeastern slope of the Central part of the Mongolian Altai, near Kobdo. Rare. vi–vii.

Thymelicus lineola (Ochsencheimer, 1808)

Arshantyn-Nuruu Mountains. Very local. vi–vii.

Hesperia comma (Linnaeus, 1758)

Different parts of the Mongolian Altai. Common. vi–vii. Subspecies' membership is not accurately identified yet.

Family Papilionidae Latreille, 1802

Parnassius phoebus (Fabricius, 1793)

The species is very local in the Mongolian Altai. Three subspecies have been described: *chingizid* Yakovlev, 2006, *bajangolus* Yakovlev, 2006, and *tsenguun* Churkin, 2003. Their distribution is given in Fig. 12. *Parnassius phoebus chingizid* occurs in the northwestern highlands of the Mongolian Altai (Elt-Gol Valley). It is very similar to the nominate subspecies and to ssp. *halasicus* Huang & Murayama, 1992 described from the Chinese part of the Mongolian Altai. *P. phoebus bajangolus,* a very unique subspecies, is tiny, brightly coloured, externally different from ssp. *tsenguun* with a very characteristic pattern. This subspecies is distinguished by the following characters: the dentate internal margin of the marginal band on the forewing (males), the very small red spots on the hindwing (males), clearly defined black postdiscal band on the forewing (males); the very small spots in $Sc+R_1/Rs$ and M_1/M_2 on the hindwing (males); well-defined submarginal row of dark spots on the hindwing (males); well-defined white crescent-shaped submarginal spots on the forewing (females); and the well-defined row of submarginal white lunules on the hindwing (females). *P. phoebus bajangolus* is found in uplands of the Arshantyn-Nuruu Mountains, and *P. phoebus tsenguun* is widespread in the southeastern highlands of the Mongolian Altai.

Parnassius nomion Fischer de Waldheim, 1823

Parnassius nomion saldaitisi Churkin, 2005

The only population of this species in the territory of the Mongolian Altai was found by Churkin in the Khan-Tajshiryn-Nuruu Mountains. Very local and rare. vii.

Parnassius apollo (Linnaeus, 1758)

Ulasty-Gol, Sara-Syumbe, Bolshoi Ku-Irtyz (Meinhard 1910). Very local and rare. vii.

***Parnassius eversmanni* Ménétriés in Siemaschko, 1850**

A small population was found in the region of the Potanin glacier on the southern slopes of the Tabyn-Bogdo-Uul Mountains. vii.

***Papilio machaon* Linnaeus, 1758**

Common species. v–vii. Ssp. *orientis* Verity, 1911 is found in the backbone of the Mongolian Altai. Specimens from southern slopes of the Mongolian Altai and deserts of the Dzhungarian Gobi belong to the ssp. *centralis* Staudinger, 1886.

Family Pieridae Duponchel, 1835

***Leptidea sinapis – reali* group**

Meinhard (1910) noted *L. sinapis* (L.) in the north of the Chinese part of the Mongolian Altai (Krana Valley, near Sara-Syumbe). As there are no specimens of this species group in the Zoological Museum of Tomsk University, and as examination of genitalia is necessary for more accurate identification, this list only includes the species group.

***Euchloe ausonia* (Hübner, 1804)**

Only a few specimens were found in the river valley of the Bulgan-Gol. v.

***Euchloe ochracea* (Trybom, 1877)**

Euchloe ochracea naina Kozhantschikov, 1923

The species occurs in a number of places in the backbone of the Mongolian Altai (Shadzgat-Nuruu Mountains). Very rare. vi–vii.

***Euchloe creusa* (Doubleday, 1847)**

Euchloe creusa orientalis (Bremer, 1864)

The species occurs in a number of places along the ridge of Mongolian Altai (upper river Kobdo-Gol, Shadzgat-Nuruu Mountains, Elt-Gol Valley, Arshantyn-Nuruu Mountains). Rare. v–vii.

***Aporia crataegi* (Linnaeus, 1758)**

Northern part of Mongolian Altai. Rare. vi–vii.

***Pontia chloridice* (Hüber, 1813)**

Steppe, semi-desert and desert zones all along the Mongolian Altai. Common. Two generations occur in the south.

***Pontia edusa* (Fabricius, 1777)**

Different parts of the Mongolian Altai. Common. V–viii. Two generations occur in the south.

***Pontia callidice* (Hübner, 1800])**

Different parts of the Mongolian Altai. Very rare. vi–vii.

***Pieris bryoniae* (Hübner, 1806)**

Pieris bryoniae mihon Yakovlev, 2006

Forest belt. Detected in different areas. Rare and local. vi–vii.

***Pieris rapae* (Linnaeus, 1758)**

Very common for uplands and valleys of the Mongolian Altai. v–vii.

***Pieris krueperi* Staudinger, 1860**

Pieris krueperi devta (de Nicéville, 1884)

Only one specimen was collected 30 km north of Bulgan somon (Bulgan-Gol Valley).

***Colias erate* (Esper, 1805)**

Common for steppe, semi-dessert, and desert belts, sporadic in the meadows of the northern part (Elt-Gol valley) (Yakovlev & Doroshkin 2006). v–viii.

***Colias hyale* (Linnaeus, 1758)**

Meadows in the north. Rare. vi–vii.

***Colias mongola* Alphéraky, 1897**

Elt-Gol, Shadzgat-Nuruu, Khan-Tajshiryn-Nuruu, Khara-Adzgarajtyn-Nuruu and Khasgt-Khairkhan Mountains. Rare. vi–vii.

***Colias tyche* (Boeber, 1812)**

Rare, Elt-Gol, Shadzgat-Nuruu, etc. Rare. vi–vii.

***Colias chrysotheme* (Esper, 1781)**

Colias chrysotheme elena P. Gorbunov, 1995

Different parts of the Mongolian Altai. Common. vi–vii.

***Colias thisoa* (Ménétriés, 1832)**

Colias thisoa cryptochrysa Yakovlev, 2006

Elt-Gol and Tsagduultai Valleys. Very rare. vi–vii.

Family Lycaenidae Leach, 1815

Neolycaena davidi (Oberthür, 1881) (Figs 13a–d)

Neolycaena davidi namkhaidorji Churkin, 2004

The species is widespread in bushes to the north and in depressions near Biger-somon. Common. vi–vii.

Neolycaena musa Zhdanko & Jakovlev, 2001 (Figs 13e–h)

Widespread. Common. vi–vii.

Neolycaena chimaera Churkin, 2004 (Figs 13i–l)

The species has been confirmed at the type locality (Sutai-Ula Mountain). The distinction of this species from *N. musa* is obvious in female genitalia morphology (Churkin 2004). Very rare and local. vii.

Neolycaena sapozhnikovi sp. n. (Figs 13m–p, 14)

Material. Holotype ♂, W. Mongolia, Hovd aimak, Bulgan-gol basin, Bayan-gol basin, middle stream Ulyastain-Sala river, 1600–1800 m, 21–23.vi.2004, V. Doroshkin, R. Yakovlev, & D. Ryzhkov leg. (ZISP). – Paratypes: 18 ♂♂, 10 ♀♀, same data (SZMN, RYB).

Description. Forewing length 13.5–15 mm. Antenna clavate, red apically. Forewing upperside pitch black, patternless, with black fringe; underside greyish brown with a dense suffusion of pale grey scales (better defined basally, along costa and in hindwing), with a V-shaped streak near apex of discal cell, apically directed towards outer wing margin, with an irregular row of white streaks in submarginal area; streaks slightly curved, crescent-shaped in cells R_{4+5}–M_1, M_1–M_2, M_2–M_3 and straight in cells M_3–Cu_1 and Cu_{1-2}; obscure submarginal black dots increasing from medial to cubital area; spots in medial area ringed with obscure white circles; forewing border white, slender. Hindwing with a white V-shaped streak near apex of discal cell and an irregular row of crescent-shaped white spots in postdiscal area, underlined distally with black streaks; submarginal area with small red dots with incomplete black rings, typical for congeners; with a slender white border.

Male genitalia: Consistent with general characteristics of the genus. Uncus quite reduced, fused with tegumen; fusion area obscure. Gnathal arms long, hook-shaped, apically acute. Valvae short, lanceolate, with an almost straight costal margin and a slightly curved lower one. Saccus small, with an acute apex protruding backwards. Phallus long (ca. 2× of valval length), slightly curved in basal third, with a pair of baculate cornuti.

Female genitalia: Ovipositor lobes making broad semi-circle. Apophyses posteriores 4× longer than ovipositor lobes. Apophyses anteriores not developed. Antrum funnel-shaped, wide and truncate, strongly sclerotized basally. Ductus bursae very short; corpus strongly sclerotized basally, globe-shaped, with a pair of small claw-shaped signa lateralally.

Habitat. The species occurs on dry slopes with bushes, overgrown with several *Caragana* Fabr. (Fabaceae) species.

Fig. 13. *Neolycaena*: **a**: *davidi namkhaidorji* Churkin, 2004, ♂ (upperside), Khovd aimak, near Stanok-Khongo, 2000 m, 18.06.2003, R. Yakovlev (RYB), **b**: *davidi namkhaidorji* Churkin, 2004, ♂ (underside), **c**: *davidi namkhaidorji* Churkin, 2004, ♀ (upperside), same locality (RYB), **d**: *davidi namkhaidorji* Churkin, 2004, ♀ (underside), **e**: *musa* Zhdanko & Jakovlev, 2001, ♂, (upperside) Khovd aimak, 50 km S of Mankhan somon, 2200 m, 21.06.2003, R. Yakovlev leg. (RYB), **f**: *musa* Zhdanko & Jakovlev, 2001, ♂, (underside), **g**: *musa* Zhdanko & Jakovlev, 2001, ♀, (upperside), same locality (RYB), **h**: *musa* Zhdanko & Jakovlev, 2001, ♀, (underside), **i**: *chimaera* Churkin, 2004, ♀, paratype (upperside), Khovd aimak, Sutai-Ula Mountains (RYB), **j**: *chimaera* Churkin, 2004, ♀, paratype (underside), **k**: *chimaera* Churkin, 2004, ♀, paratype (upperside), Khovd aimak, Sutai-Ula Mountains (RYB), **l**: *chimaera* Churkin, 2004, ♀, paratype (underside), **m**: *sapozhnikovi* **sp. n.**, ♂, holotype (upperside), **n**: *sapozhnikovi* **sp. n.**, ♂, holotype (underside), **o**: *sapozhnikovi* **sp. n.**, ♀, paratype (upperside), **p**: *sapozhnikovi* **sp. n.**, ♀, paratype (underside). Scale bar = 1 cm.

Diagnosis. The new species belongs to the subgenus *Rhymnaria* Zhdanko, 1983. It appears to be closely related to *Neolycaena chimaera* Churkin, 2004 and *N. submontana saurica* Zhdanko, 1998 (bona fida species?), but it can be easily distinguished from these species in having a distinct V-shaped white streak on the underside of the forewing, stronger sclerotization of the corpus bursae basally, wider globe-shaped corpus bursae, and the poorly curved phallus.
Etymology. The species is named after a well-known Russian geographer – Prof. V. Sapozhnikov (1861–1924).

***Callophrys rubi* (Linnaeus, 1758)**

Arshantyn-Nuruu Mountains. Very rare. v–vii.

***Callophrys suaveola* (Staudinger, 1881)**

Arshantyn-Nuruu Mountains. Very rare. v. New for Mongolian fauna.

***Cigaritis epargyros* (Eversmann, 1854)**

Alag-Nuur Lake. Very rare. vi–vii. New for the Mongolian Altai.

***Lycaena phlaeas* (Linnaeus, 1761)**

Elt-Gol, Shadzgat-Nuruu. Rare. vi–vii.

***Thersamolycaena dabrerai* (Bálint, 1996)**

Southern slopes of the Mongolian Altai and in Dzhungarian Gobi desert. Very rare. vi–vii.

***Thersamolycaena adbayar* Churkin, 2004**

Endemic species of Khan-Tajshiryn-Nuruu Mountains. Locally common. vii.

***Thersamolycaena violacea* (Staudinger, 1884)**

Khara-Belchir-Daba pass (Khovd aimak). Very rare. vii.

***Thersamolycaena dispar* (Haworth, 1803)**

Thersamolycaena dispar rutila (Werneburg, 1864)

Chinese part of Mongolian Altai (Bala-Irtsis). Very local. vii.

***Heodes hippothoe* (Linnaeus, 1758)**

Chinese part of Mongolian Altai, Dzhangiz-Agach Valley (Meinhard, 1910). Very local. vii.

***Heodes alciphron* (Rottemburg, 1775)**

Chinese part of Mongolian Altai, Kurty river Valley (Meinhard, 1910), Arshantyn-Nuruu Mountains. Very local. vi–vii.

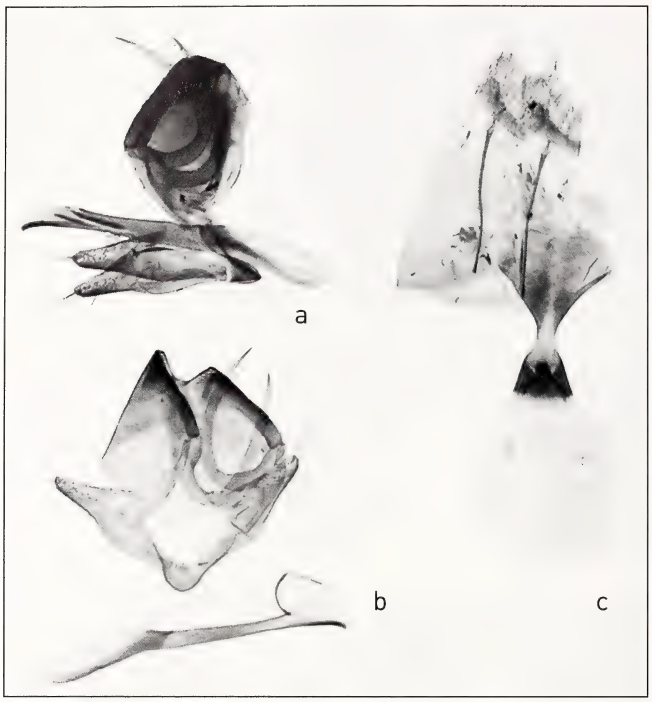

Fig. 14. Genitalia of *Neolycaena sapozhnikovi* **sp. n.**: **a**: male genitalia (lateral projection), **b**: male genitalia (ventral projection), **c**: female genitalia.

***Heodes virgaureae* (Linnaeus, 1758)**

Different parts of the region (Bulgan-Gol Valley, Kobdo-Gol Valley). Local. vii.

***Athamanthia dimorphus* (Staudinger, 1881)** **(Figs 15a–d)**

Athamanthia dimorphus mongoliana Churkin, 2006

Widespread in southern parts, on the territory of Hovd and Gobi-Altai aimaks. Rare. vi–vii.

***Athamanthia athamantis* (Eversmann, 1854)**

This species is very localised in deserts and semi-deserts in the south (Fig. 16). Two subspecies are described: *bulganica* Churkin & Yakovlev, 2006 (LT: Hovd aimak, Dzungarian Gobi Des., 15 km E of Bulgan-somon) (Figs 15e–h); ssp. *pletnevi* Churkin 2004 (LT: Gobi-Altai aimak, 30 km SE Bugat somon) (Figs 15i–l). Both populations are strictly isolated, and although these butterflies are easily distinguished, their status requires further research. Populations with transitional characters may occur in vast plain areas of Dzungarian Gobi. Despite very little available material, both taxa are here considered valid subspecies.

***Everes argiades* (Pallas, 1771)**

Recorded in different places of the southern slope (Bodonchin-Gol and Bulgan-Gol Valleys) (Alberti 1971). vii.

Fig. 15. *Athamanthia*: **a**: *dimorphus mongoliana* Churkin, 2006, ♂ (upperside) W. Mongolia, Hovd aimak, Bulgan-gol basin, Arshantyn-Nuruu Mountains, 1700 m, 19.07.2009, E. Guskova & R. Yakovlev leg. (RYB), **b**: *dimorphus mongoliana* Churkin, 2006, ♂ (underside), **c**: *dimorphus mongoliana* Churkin, 2006, ♀ (upperside), same locality (RYB), **d**: *dimorphus mongoliana* Churkin, 2006, ♀ (underside), **e**: *athamantis bulganica* Churkin & Yakovlev, 2006, ♂, paratype (upperside) (RYB), **f**: *athamantis bulganica* Churkin & Yakovlev, 2006, ♂, paratype (underside), **g**: *athamantis bulganica* Churkin & Yakovlev, 2006, ♀, paratype (upperside) (RYB), **h**: *athamantis bulganica* Churkin & Yakovlev, 2006, ♀, paratype (underside), **i**: *athamantis pletnevi* Churkin 2004, ♂, topotype (upperside) (RYB), **j**: *athamantis pletnevi* Churkin 2004, ♂ (underside), **k**: *athamantis pletnevi* Churkin 2004, ♀, topotype (upperside) (RYB), **l**: *athamantis pletnevi* Churkin 2004, ♀ (underside). Scale bar = 1 cm.

Tongeia fischeri (Eversmann, 1843)

Elt-Gol Valley (Yakovlev & Doroshkin 2006). Very local. vii.

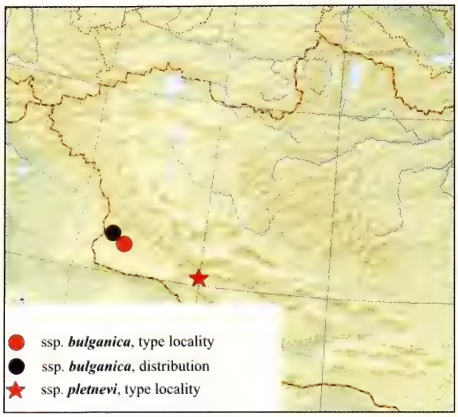

Fig. 16. Distribution of *Athamanthia athamantis* (Eversmann, 1854) in the Mongolian Altai.

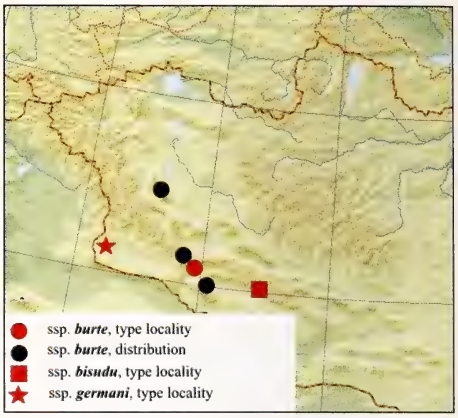

Fig. 17. Distribution of *Tongeia bisudu* Zhdanko & Jakovlev, 2001.

Fig. 18. Distribution of subgenus *Inderskia* Korshunov, 2000.

Tongeia bisudu Zhdanko & Jakovlev, 2001

The species is endemic to the Mongolian Altai. Different subspecies are present in different areas, and their status requires further investigation. The nominate subspecies is known from the Gobi Altai aimak, 15 km S Altai (1800 m); ssp. *burte* Churkin, 2003 is also known from the Gobi Altai aimak, but from 30 km W Tsogt somon (1800–1900 m); ssp. *germani* Yakovlev, 2004 is known from the estern part of Dzungarian Gobi desert, Uvkhod-Ula Mountains (1100–1300 m). Thus, the subspecies populations are isolated from each other (Fig. 17).

Tongeia arata Yakovlev, 2009

Arshantyn-Nuruu Mountains. Endemic, very rare. vi–vii.

Cupido prosecusa (Erschoff, 1874)

Dzungarian-Gobi, Alag-Nuur Valley. Very local. v–vii. Bivoltine.

***Cupido minimus* (Fuessly, 1775)**

Elt-Gol Valley – nominate ssp., Arshantyn-Nuruu Mountains – ssp. *tusovi* Lukhtanov, 1994, Khan-Taisharyn-Nuruu Mountains – ssp. *lhagvajavi* Churkin, 2004. The status needs further investigations. Very local. vi–vii.

***Celastrina argiolus* (Linnaeus, 1758)**

Recorded in Bulgan-Gol Valley (Grosser, 1981).

***Paleophilotes svetlana* (Yakovlev, 2003)**

Endemic. Arshantyn-Nuruu Mountains. v. Very local and rare. At present, the complex of species belonging to subgenus *Inderskia* Korshunov, 2000 (Zhdanko 2004) is represented with the following species *P. panope* (Eversmann, 1851) (Northwestern Kazakhstan), *P. marina* Zhdanko, 2004 (Eastern Kazakhstan, Arkaly Mountains), and *P. svetlana* (Yakovlev, 2003) (Western Mongolia) (Fig. 18). It should be noted that all species share the same host plant, *Astragalus lasiophyllus* Ledebur (Fabaceae).

***Scolitantides orion* (Pallas, 1771)**

Chinese part of the Mongolian Altai (Sara-Syumbe), Elt-Gol Valley, Arshantyn-Nuruu Mountains, Shadzgat-Nuruu Mountains. Local. vi–vii.

***Glaucopsyche argali* (Elwes, 1899)**

Glaucopsyche argali chingiz Churkin, 2005

Hovd aimak, Khazhigijn-Nuruu Mountains.Very local and rare. vi.

***Plebejus argus* (Linnaeus, 1758)**

Arshantyn-Nuruu Mountains, Tsagan-Gol. Local. vi–vii.

***Plebejus argyrognomon* (Bergsträsser, 1779)**

This species is common in the lowlands and uplands of the Mongolian Altai. Its subspecific structure is difficult to determine. The described subspecies are as follows: *chalcha* Korshunov, 1982 (slopes of the Mongolian Altai facing the Great Lakes Valley), *gobianus* Churkin, 2004 and *gabrieli* Bálint, 1989) (southern slopes of the southeastern part of the Mongolian Altai). The status of the subspecies *anceps* Churkin, 2004 needs closer scrutiny. The taxon description is based on a restricted series of smaller specimens, collected in the Sutai-Ula Mountains (Hovd aimak) and sympatric with the typical larger *chalcha* Korshunov, 1982. The noticeable hiatus and absence of transitional forms have been used as the basis for the description of the subspecies (Churkin 2004). Churkin (2004) explained the sympatric habitation of the two subspecies by the presence of an ecological barrier between the two populations (with different flight periods of imagos, different host plants, etc.). The intergradation area between the two subspecies in the given region (Sutai-Ula Mt.) is unlikely.

***Plebeius idas* (Linnaeus, 1761) group**

Most publications on Northern Asia (Tuzov et al. 2000, Churkin & Zhdanko 2003, Tshikolovets et al. 2009) treat *idas* as a complex of species, semispecies or subspecies. Strong geographic variation and slightly differentiated morphological forms lead to strongly differing views on the taxonomy. Churkin & Zhdanko (2003) thoroughly examined the eastern Palaearctic *idas*. It appears that the Mongolian populations of *idas* should be considered as well differentiated subspecies. At present the Mongolian Altai *idas* can be subdivided into four easily differentiated subspecies based on the external characters (they have not as yet been found as sympatric populations): *Plebejus idas sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999 (LT: Russia, SE Altai, Kosh-Agach distr., Sailjugem Mountains, Dzhumaly river), *P. idas munkhbayar* Churkin & Zhdanko, 2003 (LT: Mongolia, Gobi-Altai aimak, 30 km S Biger somon), *P. idas belchir* Churkin & Yakovlev, 2005 (LT: Hovd aimak, 10 km N Khara-Belchir-Daba pass) and *P. idas shadzgat* Yakovlev, **ssp. n.**

***Plebejus idas sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999 (Figs 19a–d)**

This highland subspecies is common in regions of the Russian Altai, bordering Mongolia (Sailjugem Mountains, Ukok Plateau, South-Chuya Mountains, Chikhaceva Mountains), and in the north of the Mongolian Altai (alpine zone of the Bayan Ulgijsky aimak). Southward in the backbone of the Mongolian Altai.

***Plebejus idas shadzgat* ssp. n. (Figs 19e–h)**

This subspecies is described because the population of *idas* located soutward of the *P. idas sailjugemicus* population, in the Shadzgat-Nuru Mountains is very different externally from the other *idas* populations.

Material. Holotype ♂, W. Mongolia, Hovd aimak, Bulgan-Gol basin, Uljastyin-Gol Valley, Shadzgat-Nuruu Mountains, 2500–3000 m, 25–26.vi.2004, R. Yakovlev & D. Ryzhkov leg. (ZISP). – Paratypes: 22 ♂♂, 6 ♀♀, same data (SZMN, RYB).

Description. Forewing length 12.5–14 mm (male), 14–15 mm (female). *Male:* Forewing upperside bright blue, with a black border of medium width and white fringe; underside pale grey, with a small suffusion of bluish scales basally; underside with a small black semi-oval spot near apex of discal cell, surrounded with a narrow white border, and an S-shaped row of black round dots, edged with white narrow rings in postdiscal area; submarginal orange spots, underlined with black streaks laterally and proximally, increasing in size towards tornus; slender black wing border. Hindwing underside with a row of small black dots basally, a slender black, white-bordered streak at apex of discal cell, and a strongly curved row of black dots postdiscally; orange submarginal lunules well-defined, underlined with expressed dashes of lustrous turquoise scales laterally and crescent-shaped black dashes proximally; area between postdiscal and submarginal rows dots lunules mainly white; wing border slender, black. *Female:* Forewing upperside greyish brown, with a rather well-defined blue area in discal zone; hindwing with an intensive blue area, better defined in discal zone and occupying approximately half of wing's area; underside of both wings pale brown, with a pattern similar to that of the male.

Fig. 19. *Plebeius idas* (Linnaeus, 1761) group: **a**: ssp. *sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999, ♂ (upperside), Bayan-Ulegei aimak, Kobdo-gol Valley, 20 km SW Tsengel, 1800 m, 26–30.07.2009, E.V. Guskova & R.V. Yakovlev leg. (RYB), **b**: ssp. *sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999, ♂ (underside), **c**: ssp. *sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999, ♀ (upperside), same locality (RYB), **d**: ssp. *sailjugemicus* Zhdanko & Samodurov in Zhdanko, 1999, ♀ (underside), **e**: ssp. *shadzgat* **ssp. n.**, holotype, ♂, (upperside), **f**: ssp. *shadzgat* **ssp. n.**, holotype, ♂, (underside), **g**: ssp. *shadzgat* **ssp. n.**, paratype, ♀, (upperside), same locality (RYB), **h**: ssp. *shadzgat* **ssp. n.**, paratype, ♀, (underside), **i**: ssp. *belchir* Churkin & Yakovlev, 2005, ♂, paratype (upperside) (RYB), **j**: ssp. *belchir* Churkin & Yakovlev, 2005, ♂, paratype (underside), **k**: ssp. *belchir* Churkin & Yakovlev, 2005, ♀, paratype (upperside) (RYB), **l**: ssp. *belchir* Churkin & Yakovlev, 2005, ♀, paratype (underside), **m**: *munchbajar* Churkin & Zhdanko, 2003, ♂, paratype (upperside) (RYB), **n**: *munchbajar* Churkin & Zhdanko, 2003, ♂, paratype (underside), **o**: *munchbajar* Churkin & Zhdanko, 2003, ♀, paratype (upperside), **p**: *munchbajar* Churkin & Zhdanko, 2003, ♀, paratype (underside). Scale bar = 1 cm.

Habitat. The butterflies were collected in the forest zone (*Larix sibirica*, Pinaceae), generally near water bodies.
Diagnosis. It can be differentiated from all other subspecies by the better defined turquoise spots on the hindwing underside and the brightly coloured wing upperside in the female (the presence of the wide blue area on the upperside of both wings).
Etymology. Named after the type locality – Shadzgat-Nuruu Mountains.

***Plebejus idas munkhbajar* Churkin & Zhdanko, 2003** **(Figs 19m–p)**

Common on slopes of the southern and southwestern exposure of the Mongolian Altai. Common. vi–vii.

***Plebejus idas belchir* Churkin & Yakovlev, 2005**

Backbone area of the Mongolian Altai and the northern exposure (southward from Mankhan somon, Hovd aimak) (LT: Hovd aimak, 10 km N Khara-Belchir-Daba pass) (Figs 19i–l). It is characterized by the reduction of the pattern on the underside of the wing.

* ***Plebejus sharga* Churkin, 2004**

Recorded only in the valley of Sharga somon, not in the Mongolian Altai.

***Plebejus chrystophi* (Staudinger, 1874) group**

A thorough review of the species group resulted in a division into two subgroups according to host plants (Zhdanko & Churkin 2001): subgroup *chrystophi* (host plant *Alhagi* (Fabaceae)) and subgroup *samudra* (host plant *Hippophaea*, Elaeagnaceae). Taking into account opinion (Zhdanko & Churkin 2001) that allopatric populations represent infant species, these taxa are described below as separate species: *P. anikini* **sp. n.** (*P. chrystophi* subgroup) and *P. germani* **sp. n.** (*P. samudra* subgroup).

***Plebejus anikini* sp. n.** **(Figs 20a–d, 21a)**

Material. Holotype: ♂, SW Mongolia, Gobi-Altai aimak, Dzhungarian Gobi, Alag-Nuur lake, near Ajlyn-Tsagan-Khuduk, 9–10.vii.2010, 1300 m, 45°09'N, 94°30'E; R. Yakovlev, E. Guskova & V. Doroshkin (ZISP). Paratypes: 30 ♂♂, 22 ♀♀, same data (ZISP, SZMN, RYB, VDC).

Description. Forewing length 13–14 mm. *Male:* Wing upperside light blue, lusterless, forewing with a black slender obscure border, hindwing with a wider border and a row of small obscure black dots submarginally; fringe white. Wing underside pale grey, with a dense suffusion of silver scales, an S-shaped row of tiny black dots postdiscally and very small obscure grey dots underlined with an obscure pale area submarginally; border very slender, black. *Female:* Slightly larger. Forewing dark brown, with bluish-grey streaks between veins in discal area and a well-defined suffusion of bluish scales basally; small obscure bluish streaks present between veins submarginally; broad black border, broken at veins. Hindwing upperside with a well-defined suffusion of blue scales basally, a row of black dots on outer margin, surrounded with red obscure rings; border black, rather broad; fringe white. Male genitalia: Uncus medium-sized, fastigiated apically; gnathal

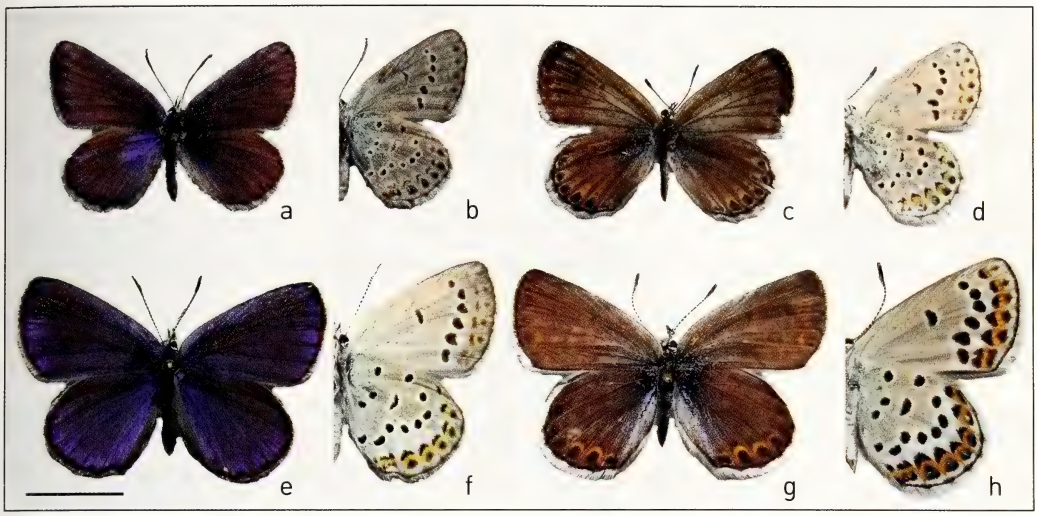

Fig. 20. *Plebejus chrystophi* (Staudinger, 1874) group in the Mongolian Altai: **a**: *anikini* **sp. n.**, ♂, holotype (upperside) (ZISP), **b**: *anikini* **sp. n.**, ♂, holotype (underside), **c**: *anikini* **sp. n.**, ♀, paratype (upperside) (ZISP), **d**: *anikini* **sp. n.**, ♀, paratype (underside), **e**: *germani* **sp. n.**, ♂, holotype (upperside) (ZISP), **f**: *germani* **sp. n.**, ♂, holotype (underside), **g**: *germani* **sp. n.**, ♀, paratype (upperside) (ZISP), **h**: *germani* **sp. n.**, ♀, paratype (underside).

arms of medium length; valva gradually rounded on costal margin and almost smooth ventrally (with a small hollow in the middle third) and distally divided into two parts with a shallow hollow; costal process semicircle apically, more strongly protruding forwards than the ventral process, which is shorter and smaller; juxta U-shaped; aedeagus shorter than valva, of medium thickness, gradually narrowing apically, slightly curved.

Habitat. Found locally in the desert near a well (fountain, Khuduk). Presumed host plant is *Alhagi* (Fabaceae).

Diagnosis. The species is similar to *P. chrystophi* (Staudinger, 1874) differing by the dark coloring of females, and short and thick phallus in the male.

Etymology. The new species is named after the professor of Entomology and lepidopterist Vasilij Anikin of Saratov.

Plebejus germani sp. n. (Figs 20e–h, 21b)

Material. Holotype ♂, SW Mongolia, Khovd aimak, 30 km NNW of Bulgan, 1500 m, 11–13.vii.2003, R. Yakovlev & D. German (ZISP). – Paratypes: 4 ♂♂, same data (RYB); 6 ♂♂, 4 ♀♀, SW Mongolia, Khovd aimak, 15 km S of Bulgan, 1100 m, 10.vii.2007, R. Yakovlev & E. Gus'kova; 6 ♂♂, 5 ♀♀, SW Mongolia, Khovd aimak, 50 km N Uench, 1500 m, 6.vii.2007, R. Yakovlev & E. Gus'kova (ZISP, RYB).

Description. Forewing length 15–17 mm. *Male:* Wing upperside blue, with a slender black border on outer margin; underside cream, with a sparse suffusion of bluish scales basally. Forewing with an elongate spot of medium size, narrow-bordered with white, near apex of discal cell and with an S-shaped row of rather large black round dots, edged with narrow white rings; red submarginal spots poorly defined, obscure, underlined with black streaks proximally and distally; border very slender, black. Hindwing with a row of large black dots basally, a black C-shaped white-borderd streak

in discal cell (near to apex), a strongly curved row of black dots postdiscally; and red submarginal lunules, well defined and underlined with crescent-shaped black dashes proximally; area between postdiscal dots and submarginal lunules pale; border black, slender. *Female:* Wing upperside brown, with an admixture of blue scales from base to discal area in anal margin of hindwing; underside pattern similar to that of male, but red lunules better defined.

Dianogsis. This species resembles *P. churkini* Zhdanko, 2001 but can be easily separated by the suberect costal process on the apex of the valva and a less smooth ventral margin of the valve in male genitalia.

Habitat. River valleys. 15 km S of Bulgan specimens were collected at *Hippophaea* bushes (Elaeagnaceae).

Etymology. The new species bears the name of the well-known botanist, Brassicaceae specialist, Dr. Dmitrij German of Barnaul.

***Plebejus lucifera* (Staudinger, 1867)**

Common species in different locations. vi–vii.

***Plebejus pylaon* (Fischer von Waldheim, 1832)**

Elt-Gol Valley, vii, very rare. In the Mongolian Altai ssp. *katunensis* Bálint & Lukhtanov, 1990.

***Eumedonia eumedon* (Esper, 1780)**

Different locations. Common. vi–vii.

***Aricia artaxerxes* (Fabricius, 1793)**

Arshantyn-Nuruu Mountains, Elt-Gol Valley. Common. vi–vii.

***Aricia agestis* (Denis & Schiffermüller, 1775)**

Bayan-Ulegei aimak, Monkh-Khairkhan Uul Mountains (Balint et al. 2006). Very rare.

***Aricia chinensis* (Murray, 1874)**

Hovd aimak, slopes facing the Great Lakes Valley. Rare. vi.

***Aricia nicias* (Meigen, 1830)**

Aricia nicias borsippa (Fruhstorfer, 1915)

Arshantyn-Nuruu Mountains, upper stream of the Bulgan-Gol River, slopes facing the Great Lakes Valley. Very rare and local. vii.

***Agriades glandon* (de Prunner, 1798)**

Geographic variability is described in detail by Churkin (2005). Two subspecies are present, *ustjuzhanini* Yakovlev & Churkin, 2003 (Khan-Taicharyn-Ula Mountains) and *batchimeg* Churkin, 2005 (along the main ridge). Local. vi–vii.

***Albulina orbitulus* (de Prunner, 1798)**

Two subspecies are present: *jugnei* Churkin, 2004 (Khan-Taicharyn-Ula Mountains) and *sajana* (Heyne, 1895) (along the main ridge). Local. vi–vii.

***Cyaniris semiargus* (Rottemburg, 1775)**

Cyaniris semiargus altaiana Tutt, 1909

Bulgan-gol basin, Elt-Gol Valley, Local. vi–vii.

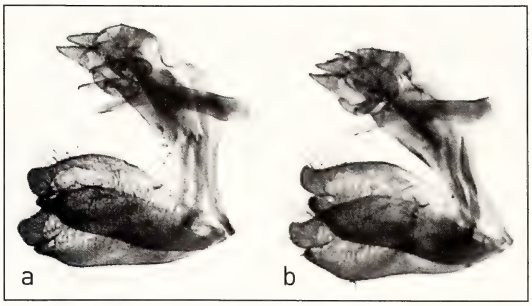

Fig. 21. Genitalia of males (lateral projection): **a**: *Plebejus anikini* **sp. n.**, **b**: *Plebejus germani* **sp. n.**

***Rimisia miris* (Staudinger, 1881)**

Khovd aimak, 15 km E of Bulgan somon. Very rare and local. vii.

***Plebejidea cyane* (Eversmann, 1837)**

Plebejidea cyane kozhantshikovi Sheljuzhko, 1928

Different parts. Local all over. vi–vii.

***Polyommatus amandus* (Schneider, 1792)**

Dzungarian Gobi, Bulgan-Gol basin. Very rare. vii.

***Polyommatus erotides* (Staudinger, 1892)**

Polyommatus erotides kaabaki Korb, 2000

Bayan-Ulegei and northern part of Hovd aimaks. Local. vii.

***Polyommatus aloisi* Bálint, 1988**

Polyommatus aloisi dividus Churkin, 2003

Species related to the previous one, spread in the south. Common. vi–vii.

***Polyommatus icarus* (Rottemburg, 1775)**

Widespread. The geographical variability in Mongolia is poorly studied. Two subspecies: nominate (north) and *szabokyi* Balint, 1990 (Dzungarian part). Populations from the southern part of Mongolia are bivoltine.

***Agrodiaetus damon* (Denis & Schiffermüller, 1775)**

Agrodiaetus damon mongolensis (Koçak, 1980)

Recorded only in the Chinese part (Kurty river valley). Very rare. vii.

***Agrodiaetus mediator* Dantchenko & Churkin, 2003**

Endemic in southern parts. vii, very local. Two subspecies are present: *mediator* (Taycharyn-Ula, Hara-Adzragyn-Nuru, Khasagt-Khairkhan Mountains) and *habievi* Yakov-

lev, 2004 (southern slopes). The placement of *habievi* has been controversial. Yakovlev (2004) described the subspecies *A. mediator habievi*. Later on, this taxon was considered as a subspecies of a different species, *A. damone habievi* (Tshikolovets et al. 2009). However, the original decision to describe *habievi* as a subspecies of *A. mediator* resulted from a study of the mitochondrial DNA sequence (Vodolazhsky et al. 2011) and the view that this is a valid taxon is here maintained.

***Agrodiaetus damone* (Eversmann, 1841)**

Two subspecies are present: *altaica* Elwes, 1899 and *bogdoolensis* Dantchenko & Lukhtanov, 1997. Very local. vii.

***Agrodiaetus ripartii* (Freyer, 1830)**

Arshantyn-Nuruu Mountains. Very rare and local. vii.

Family Nymphalidae Swainson, 1827

***Melanargia russiae* (Esper, 1783)**

Sporadic specimens in the Chinese part (Kurty and Kairty rivers) and the Arshantyn-Nuruu Mountains. Very rare and local. vii.

***Boeberia parmenio* (Boeber, 1809)**

Different part of Mongolian Altai. Rare. vi–vii.

***Lasiommata maera* (Linnaeus, 1758)**

Chikertey and Arshantyn-Nuruu Mountains. Very local and rare. vii.

***Coenonympha tullia* (Müller, 1764)**

The species is local in the alpine belt up to highlands of the Gobi-Altai aimak in the southeast. Populations belong to ssp. *elwesi* Davenport, 1941, described from the Russian Altai. Populations to the south from the Munkh-Khairkhan Mountains require futher study.

***Coenonympha glycerion* (Borkhausen, 1788)**

Coenonympha glycerion iphicles Staudinger, 1892

Recorded in the northern part. Local. vi–vii.

***Coenomympha amaryllis* (Stoll in Cramer, 1782)**

Very common in different parts. vi–vii.

***Coenonympha pamphilus* (Linnaeus, 1758)**

Chinese part of the Mongolian Altai (Sara-Syumbe) and Arshantyn-Nuruu Mountains. Rare. vi.

***Lyela myops* (Staudinger, 1881)**

Single specimen collected in the western part of Dzungarian Gobi, Uvkhod-Ula Mt. Very rare. v.

***Triphysa dohrnii* Zeller, 1850**

Local and rare (Tsagan-Kol lake, Kobdo-Gol river Valley, Arshantyn-Nuruu, Shadzgat-Nuruu Mountains), vi–vii.

***Proterebia afra* (Fabricius, 1787)**

Arshantyn-Nuruu Mountains. Rare and local. V. New to the Mongolian fauna.

***Erebia jeniseiensis* Trybom, 1877**

Erebia jeniseiensis ryzhkovi Yakovlev, 2006

Elt-Gol Valley. Very local. vii.

***Erebia kefersteini* (Eversmann, 1851)**

Tabyn-Bogdo Mountains in the north. Very rare and local. vii.

***Erebia kindermanni* Staudinger, 1881**

Elt-Gol Valley and Tsagan-Gol lake. Very local. vii.

***Erebia tsengelensis* Suwa, Hirano & Hirano, 2002**

Chinese part of Mongolian Altai, Kobdo-Gol Valley, Arshantyn-Nuruu Mountains, upper stream of Bulgan-Gol, Alag-Khairhan Mountain. Local. vii. Endemic species. Two subspecies: nominate (northern part of the Mongolian Altai) and *alag* Churkin, 2005 (Alag-Khairhan Mountains). Local. vii.

***Erebia theano* (Tauscher, 1806)**

Erebia theano dyachenkoi Yakovlev, 2006

Chinese part of Mongolian Altai, Elt-Gol Valley, Khoton-Nuur lake. Local. vii.

* ***Erebia rossi* (Curtis in Ross, 1834)**

Only in border regions of Russian part of Altai (Ukok plateau, Sailjugem Mountains, Talduair Mountains etc.), not found in the Mongolian Altai

***Erebia callias* Edwards, 1871 group**

The Asian taxa of this species group have been recently revised (Bogdanov 2008). The material collected in Southern Siberia, Eastern Kazakhstan and Mongolia confirms the presence of three valid species.

* ***Erebia callias*** **Edwards, 1871**

Recorded in border regions of Russian part of Altai (Ukok plateau, Tashanta etc.), not found in the Mongolian Altai. In Russian Altai, ssp. *altajana* Staudinger, 1901 (Figs 22a–b, 23a, 25). In 2003 *Erebia callias chastilovi* Churkin, 2003 from the Khan-Taycharyn-Ula Mountains and the Tsakhir-Khalgyn-Nuruu Mountains was described as a subspecies that is very different externally from the typical Altaian, Sayan, and Pribaikal species populations. Considerable distinguishing characters have been revealed in the genitalia morphology, which helps establish its specific rank and establish a new status *Erebia chastilovi* Churkin, 2003, **stat. n**.

Erebia przhevalskii **sp. n. (Figs 22e–h, 23b, 24 a–d, 25)**

M a t e r i a l . Holotype ♂, W. Mongolia, Hovd aimak, Bulgan-Gol basin, Uljastyin-Gol Valley, Shadzgat-Nuruu Mountains, 2800–3000 m, 25–26.vi.2004, R. Yakovlev & D. Ryzhkov leg. (ZISP). – Paratypes: 40 ♂♂, 5 ♀♀, same data; 5 ♂♂, 3 ♀♀, W. Mongolia, Bayan-Ulegei aimak, Kobdo-gol Valley, 20 km SW Tsengel, 2400 m, 48°49'N; 88°59'E, 25–27.vii.2010, E.V. Guskova & R.V. Yakovlev leg (SZMN, RYB).

Description. Forewing length 16.5–17.5 mm. *Male:* Wings wide, rounded apically, with a semicircle on outer margin; upperside dark brown. Forewing with an ochreous area postdiscally, a double black ocellus near apex, centered with a pair of white pupils; underside with a broad ochreous zone medially, greyish areas marginally, a double black ocellus apically, centered with a pair of white pupils. Hindwing in half of specimens with small ochreous dashes submarginally and 1–3 small black ocelli; underside pale grey, with a broad band rough at margins in discal area, narrowing towards tornus. A number of specimens bearing 1–3 black ocelli submarginally. *Female:* Externally similar to male, with a better defined ochreous pattern on forewing upperside; hindwing underside marmorate, patterned with very small brownish streaks.

Male genitalia. Uncus long, hook-shaped; gnathal arms acute apically, shorter than uncus. Tegumen medium-sized. Valva long, strongly narrowing apically, with a long acute process on costal margin (in its middle third), upward and forward directed, with 1–2 smaller acute denticles, directed backward and forward, on the narrow end of valva distally. Saccus small. Phallus short, thick, straight.

Female genitalia. Ovipositor lobes semicircle apically. Apophyses posteriores short, poorly sclerotized. Antevaginal plate U-shaped, very small, broad basally, with very small lateral processes. Ductus bursae short; corpus bursae more or less round, with a pair of ribbon-like signa.

Habitat. The butterflies are found in humid tundra associations with *Cobresia* (Cyperaceae) prevailing.

Diagnosis. The new species is very different from the known taxa of the group in the shape of the valva – the abrupt narrowing towards the apex and specific upward and forward directed denticles on the costal margin, where the larger denticle is the most proximal. The female genitalia differ in having a tiny antevaginal plate.

Etymology. The species is named after a well-known Russian geographer N. Przhevalsky (1839–1888).

Fig. 22. Genitalia of males (lateral projection) of *Erebia callias* group: **a**: *Erebia callias altajana*, Russia, Altai, Aktash, **b**: *Erebia callias altajana*, Russia, Altai, Ukok plateau, Maipak, **c**: *Erebia callias sibirica*, E. Kazakhstan, Saur Mountains, Tas Mt., **d**: *Erebia callias simulata*, Russia, Irkutzk region, Khamar-Daban Mountains, **e–h**: *Erebia przhevalskii* **sp. n.**, holotype (e) and paratypes (f–h), **i–k**: *Erebia chastilovi* Churkin, 2003, Gobi-Altai aimak, Khasagt-Khairkhan Mountains, 2700 m, **l–n**: *Erebia chastilovi nomada* **ssp. n.**, holotype (l), paratypes (m–n).

Erebia chastilovi **Churkin, 2003, stat. n.** **(Figs 22i–k, 23c, 24e–h, 25)**

Known from highlands in the south of the Mongolian Altai, local, vii. The nominate subspecies is recorded from the following habitats of the Gobi-Altai aimak: the Khan-Taycharyn-Ula, the Tsakhir-Khalgyn-Nuruu, the Khara-Adzragyn-Nuru, and the

Khasgt-Khirkhan Mountains *E. chastilovi* is a bona fide species and its status as a species is based on the following characters: clear external distinctions (detailed in the original description) and some distinctions in genitalia morphology (valve is strongly curved, with a specific process distally forming an almost flat area with small denticles on it, and a larger denticle at the base of the process; the antevaginal plate is U-shaped, with rather massive lateral processes, as opposed to the much smaller structures in *altajana* Staudinger, 1901). The new subspecies from the northern part of the distribution area (Khovd aimak, Ikh-Nuruu Mountains) is described and differentiated based on wing pattern elements, smaller size, and slight differences in female genitalia morphology.

***Erebia chastilovi nomada* ssp. n.** **(Figs 22i–n, 23d, 24i–o, 25)**

Material. Holotype ♂, W Mongolia, Khovd aimak, Ikh-Nuruu Mountains (between Bodonchin-Gol and Uenchin-Gol valleys), Ikh-Daba pass, 2900m, 5.vii.2007, leg. R. Yakovlev (ZISP). – Paratypes: 11 ♂♂, 4 ♀♀, same data (ZISP, RYB).

Diagnosis. The new subspecies differs from the nominate in its smaller size (the length of the forewing is 15–16.5 mm, and 16–18.5 mm in the nominate subspecies). The wing upperside in males has a better defined ochreous pattern, forming a wide area in the forewing and consisting of small submarginal dashes in the hindwing. The hindwing underside is more brightly coloured, with a very well-defined marmorate pattern. The male genitalia have no obvious distinctions. The female genitalia bear signa, strongly converging distally on the corpus bursae.
Habitat. Very dry alpian tundra-steppe.
Etymology. The subspecies name comes from the word "nomad".

***Erebia pandrose* (Borkhausen, 1788)**

Tsagan-Kol Lake, rare and local.

***Hyponephele lycaon* (Rottemburg, 1775)** **(Figs 26–27)**

This species is very variable in Central Asia. Ssp. *catalampra* (Staudinger, 1895), described from the Central Khangai Mountains, has been traditionally considered present in Mongolia and is listed in the recent book with all western and central Mongolian populations (Tschikolovets et al. 2009). However, populations from different areas of the Mongolian Altai are very variable externally and represent very well-delineated taxa, whose rank needs refinement. In order to refine the real rank considerable additional material and molecular-genetic studies are required. Here taxa from the Mongolian Altai are considered as subspecies. Probably such a profusion of phenotypes is caused by the complete isolation of river valleys in the south of the Mongolian Altai, thus making the genetic exchange between populations of *Hyponephele lycaon* impossible. The extreme west of the southern macroslope of the Mongolian Altai is inhabited with ssp. *smirnovi* Yakovlev, 2004 **stat. n.** (LT: Arshantyn-Nuruu Mountains) (Figs 26a, b). Similar topotypical butterflies were collected in the valley of Ulyastain-Gol River. Eastwards in the Mogoin-Gol river valley and the Hara-Adzragyn-Nuru Mountains a small series of specimens was collected, different from all the known forms of *Hyponephele lycaon*, and it is described here as a new subspecies.

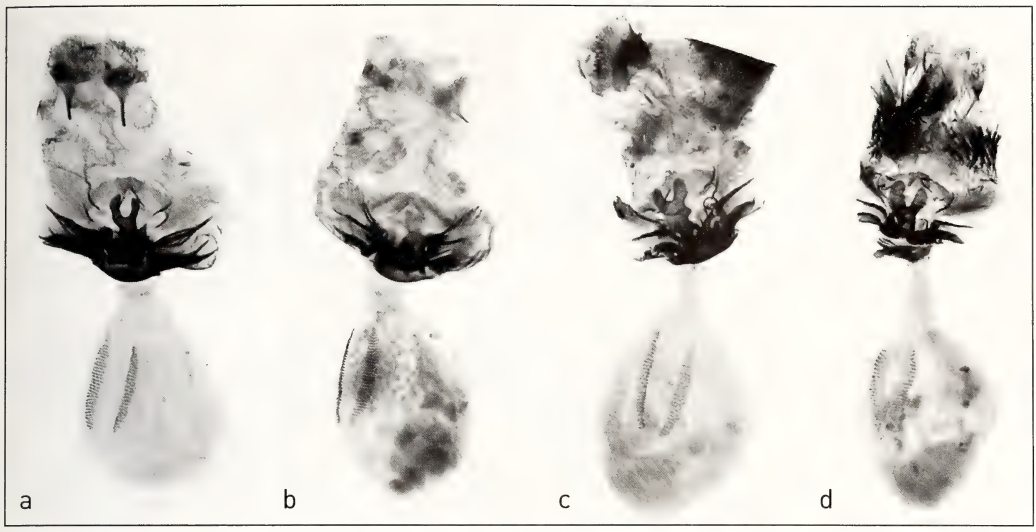

Fig. 23. Genitalia of females of *Erebia callias* group: **a**: *Erebia callias altajana*, Russia, Altai, Aktash, **b**: *Erebia przhevalskii* **sp. n.**, **c**: *Erebia chastilovi* Churkin, 2003, Gobi-Altai aimak, Khasagt-Khairkhan Mountains, 2700 m, **d**: *Erebia chastilovi nomada* **ssp. n.**

Hyponephele lycaon dmitrievae ssp. n. (Figs 26c, d, 27)

Material. Holotype ♂, SW Mongolia, Gobi-Altai aimak, Mongolian Altai Mountains (S. slope), Mogoijn-Gol Valley, 6–8.vii.2010, 1800 m, 45°39'N; 93°47'E; R. Yakovlev & E. Guskova (ZISP). – Paratypes: 10 ♂♂, 1 ♀, same data; 21 ♂♂, 13 ♀♀, Mongolia, Govi-Altai aimak,Mongolian Altai (south.sl.), Mogoin-gol R. 2000–2400 m, 8.vii.2004, Churkin S. leg. (RYB, SZMN, coll. S. Churkin).

Description. Forewing length 19–20 mm. Forewing dark greyish brown, with a well-defined ochreous area postdiscally, and a pair of rather large black ocelli; hindwing patternless; fringe grey. Forewing underside bearing a well-defined ochreous area medially and greyish margins, a very small marmorate pattern and a pair of ocelli postdiscally; hindwing underside with a well-defined marmorate pattern, two or three clear, very small ocelli submarginally, a poorly defined broad band in discal area.
Habitat. Dry steppe slopes.
Diagnosis. Small size, marbled pattern and small dots on the underside of the forewing.
Etymology. The new subspecies bears the name of the professor of Phylology Lidiya M. Dmitrieva (Barnaul), an organizer of the Friendship Community 'Mongolia-Russia'.

Hyponephele lycaon kerzhneri ssp. n. (Figs 26e, f, 27)

Material. Holotype ♂, SW Mongolia, Gobi-Altai aimak, Mongolian Altai Mountains, Hara-Adzragyn-Nuru Mountains, Najtvaryn-Sajr River Valley (under stream) 15–16.vii.2010, 1700–2000 m, 45°52'N; 95°30'E; R. Yakovlev & E. Guskova (ZISP). – Paratypes: 18 ♂♂, same data (RYB, SZMN).

Description. Forewing length 19–21 mm. Forewing brown, with a well-defined pale ochreous area postdiscally, with a pair of black ocelli; hindwing patternless; fringe grey. Forewing underside with an ochreous area medially, pale grey margins, very small marmorate pattern and one or two ocelli postdiscally. Hindwing underside pale grey, with a suffusion of brownish scales, without marmorate pattern; submarginal ocelli very often absent, sometimes one or two ocelli present. Discal broad band poorly defined.

Habitat. Dry steppe slopes.
Diagnosis. The new subspecies is easily distinguished by paler coloration of both wings and larger spots near the apex of the forewing.
Etymology. The new subspecies is named after the professor of Entomology Izyaslav Kerzhner, an active participant in the study of the Mongolian Entomofauna.

***Hyponephele lupina* (Costa, 1836)**

Bulgan-Gol river basin (Arshantyn-Nuruu Mountains), western part of the Dzhungarian Gobi desert. Very rare and local. vi–vii.

***Hyponephele narica* (Hübner, 1813)**

Hyponephele narica ambialtaica Kosterin, 2002

Near Hovd, Dzungarian Gobi. Local. vi–vii.

***Hyponephele naricina* (Staudinger, 1870)**

Dzungarian Gobi desert. Rare. vi–vii.

***Hyponephele cadusina* (Staudinger, 1881)**

Different parts. Common. vi–vii.

***Hyponephele interposita* (Erschoff, 1874)**

Recorded only in the Chinese part of Mongolian Altai – Dzhangyz-Agach (Meinhard 1910a).

***Oeneis jutta* (Hübner, 1806)**

Oeneis jutta akoene Belik & Yakovlev, 1998

Ulegem and Ulyasutai gol Valleys (Meinhard 1910a; Tshikolovets et al. 2009). Local and rare. vi–vii.

***Oeneis magna* Graeser, 1888**

Oeneis magna eltgoli Yakovlev, 2006

Elt-Gol, Ulyastain-Gol and Kobdo-Gol Valleys. Very local and rare. vi–vii.

***Oeneis norna* (Thunberg, 1791)**

Oeneis norna altaica Elwes, 1899

Elt-Gol and Chumek Valleys, Shadzgat-Nuruu Mountains. Very local and rare. vii.

***Oeneis elwesi* Staudinger, 1901**

Oeneis elwesi devius Churkin & Yakovlev, 2005

Tsagan-Nuur Lake, Suok and Tsagduultai rivers Valley, Alag-Khairkhan Mt. Very local and rare. vi–vii.

Fig. 24. *Erebia callias* group: **a**: *Erebia przhevalskii* **sp. n.**, holotype, ♂ (upperside) (ZISP), **b**: *Erebia przhevalskii* **sp. n.**, holotype, ♂ (underside), **c**: *Erebia przhevalskii* **sp. n.**, paratype, ♀ (upperside) (RYB), **d**: *Erebia przhevalskii* **sp. n.**, paratype, ♀ (underside), **e**: *Erebia chastilovi* Churkin, 2003, ♂, (upperside) Gobi-Altai aimak, Khasagt-Khairkhan Mountains, 2700 m (RYB), **f**: *Erebia chastilovi* Churkin, 2003, ♂, (underside), **g**: *Erebia chastilovi* Churkin, 2003, ♀, (upperside), same locality (RYB), **h**: *Erebia chastilovi* Churkin, 2003, ♀, (underside), **i**: *Erebia chastilovi nomada* **ssp. n.**, holotype, ♂ (upperside) (ZISP), **j**: *Erebia chastilovi nomada* **ssp. n.**, holotype, ♂ (underside), **k**: *Erebia chastilovi nomada* **ssp. n.**, paratype, ♀ (upperside) (RYB), **l**: *Erebia chastilovi nomada* **ssp. n.**, paratype, ♀ (underside), **m**: *Erebia chastilovi nomada* **ssp. n.**, paratype, ♂ (upper- and underside) (RYB), **n**: *Erebia chastilovi nomada* **ssp. n.**, paratype, ♂ (upper- and underside) (RYB), **o**: *Erebia chastilovi nomada* **ssp. n.**, paratype, ♀ (upper- and underside) (RYB). Scale bar = 1 cm.

Oeneis ammon (Elwes, 1899)

Khoton-Nuur Lake, Elt-Gol Valley. Very local and rare. vii.

***Oeneis aktashi* Lukhtanov, 1984**

Khoton-Nuur Lake. Very rare and local. vii.

***Oeneis temujin* Churkin, 2003**

Endemic species. Very rare and local. vi–vii.

***Oeneis tarpeia* (Pallas, 1771)**

Tsengel-Khairkhan and Elt-Gol Valley only. Very rare and local. vii.

***Oeneis nanna* (Ménétriés, 1859)**

Near Hovd and Khara-Adzragyn-Nuru Mountains. Very local and rare. vi–vii.

***Oeneis sculda* (Eversmann, 1851)**

Elt-Gol Valley, Alag-Khairkhan Mt. and Khoton-Nur Lake. Very local. vi–vii.

***Hipparchia autonoe* (Esper, 1783)**

Chinese part (Kairty Valley), Arshantyn-Nuruu and Sajlyugem Mountains. Local and rare species. vii.

***Arethusana arethusa* (Denis & Schiffermüller, 1775)**

Arshantyn-Nuruu Mountains. Very local. vii.

***Minois dryas* (Scopoli, 1763)**

Chinese part (Sara-Syumbe). Local. vii.

***Pseudochazara hippolyte* (Esper, 1784)**

Central and southern parts of the Mongolian Altai. Very common. vii.

***Pseudochazara pallida* (Staudinger, 1901)**

Only northern part of the Mongolian Altai (upper stream of Bulgan-Gol, Munkh-Khairkhan Mt., near Ulegei). Common. vii.

***Chazara briseis* (Linnaeus, 1764)**

Chinese part (Tsingil and Kairty rivers, Sara-Syumbe). Local. vii.

***Chazara enervata* (Staudinger, 1881)**

Arshantyn-Nuruu Mountains. Very local. vii.

***Chazara heydenreichi* (Lederer, 1853)**

Arshantyn-Nuruu Mountains, Mogoin-Gol Valley Very local. vii.

***Chazara kaufmanni* (Erschoff, 1874)**

Chazara kaufmanni doroshkini Yakovlev, 2004

Only in Dzungarian-Gobi and Bulgan-Gol Valley. Local. vii.

***Neptis rivularis* (Scopoli, 1763)**

Elt-Gol Valley, Arshantyn-Nuruu Mountains, Tsagan-Kol Lake; Chinese part: Ulasty and Krana Valleys. Local. vi–vii.

***Polygonia c-album* (Linnaeus, 1758)**

Bulgan-Gol Valley. Very local. vii.

***Polygonia interposita* (Staudinger, 1881)**

Polygonia interposita adya Churkin, 2003

Elt-Gol Valley, Arshantyn-Nuruu Mountains, Mogoin-Gol Valley, Bulgan-Gol Valley. Local and rare. vi.

***Aglais urticae* (Linnaeus, 1758)**

Different parts. Common. v–vii.

***Vanessa cardui* (Linnaeus, 1758)**

Different parts. Common. v–ix.

***Euphydryas iduna* (Dalman, 1816)**

The subspecies *sajana* Higgins, 1950 in Khara-Belchir-Daba pass, Ulyastain-Gol Valley. In the south (Arshantyn-Nuruu Mountains, Khan-Tajcharyn-Ula Mountains, Tzakhir-Khalgyn-Nuruu Mountains) – ssp. *eremita* Churkin, 2003. vi–vii.

***Euphydryas ichnea* (Boisduval, 1833)**

Northern part (Tsengel-Khairkhan Mt., Elt-Gol Valley). Local. vi–vii.

***Euphydryas aurinia* (Rottemburg, 1775)**

Two subspecies: ssp. *altivolans* Tuzov, 2000 (LT: [Russia], Altai, Severochujskij Mountains, Sunkor Mt.) in highlands of the northern part of the Mongolian Altai (Elt-Gol valley, Tsengel-Khairkhan Mt., 20 km S of Buyant-somon) (Fig. 33b) and *asiatica* Staudinger, 1881 (LT: Ala-Tau [E. Kazakhstan, Dzhungarian Ala-Tau Mountains]) in southern slopes of the Mongolian Altai (Arshantyn-Nuruu Mountains, Mogoin-Gol Valley) (Fig. 33a).

***Melitaea athalia* (Rottemburg, 1775)**

Tsagan-Kol Lake, Elt-Gol valley. Very local and rare. vii.

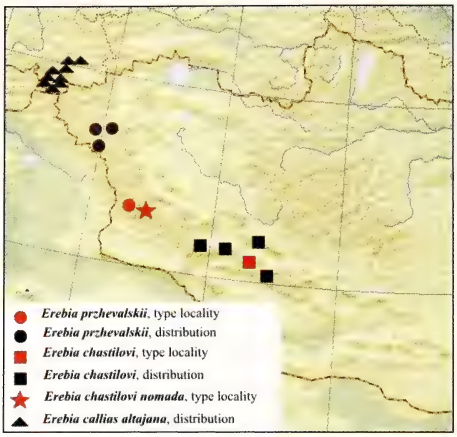

Fig. 25. Distribution of *Erebia callias* species complex in the Russian and Mongolian Altai.

***Melitaea elenae* Yakovlev, 2007**

Arshantyn-Nuruu Mountains. Endemic and very rare. vi.

***Melitaea britomartis* (Assmann, 1848)**

Tsengel-Khairkhan Mountains, Elt-Gol Valley. Rare. vi–vii.

***Melitaea menetriesi* Caradja, 1895**

Melitaea menetriesi centralasiae Wnukowsky, 1929

Tsagan-Kol Lake. Very rare. vi–vii.

***Melitaea rebeli* Wnukowsky, 1929**

Tsagan-Kol Lake, Very rare. vii.

***Melitaea rhea* Churkin & Devyatkin, 2005**

Arshantyn-Nuruu Mountains, Shadzgat-Nuruu Mountains, Alag-Khairkhan Mountains. Endemic and very rare. vi.

***Melitaea diamina* (Lang, 1789)**

Melitaea diamina erycina Lederer, 1853

Arshantyn-Nuruu Mountains, Elt-Gol Valley. Rare.vi–vii.

***Melitaea didyma* (Esper, 1778)**

Melitaea didyma turkestanica Sheljuzhko, 1929

Rare in the south Dzungarian slope, Dzungarian Gobi. V–vi.

***Melitaea didymina* Staudinger, 1895**

Adzh-Bogdo Mountains, Sutai-Uul Mountains, Tajcharyn-Ula Mountains, near Hovd. Local. vi–vii.

***Melitaea yakovlevi* Kolesnichenko, 2005**

Arshantyn-Nuruu Mountains, Shadzgat-Nuruu Mountains. Very rare endemic species. vi.

***Melitaea latonigena* Eversmann, 1847**

Melitaea latonigena altaica Grum-Grshimailo, 1893

Elt-Gol Valley. Rare and local. vii.

***Melitaea didymoides* Eversmann, 1847**

Khara-us-Nuur Lake (Alberti 1971). Very rare. vi.

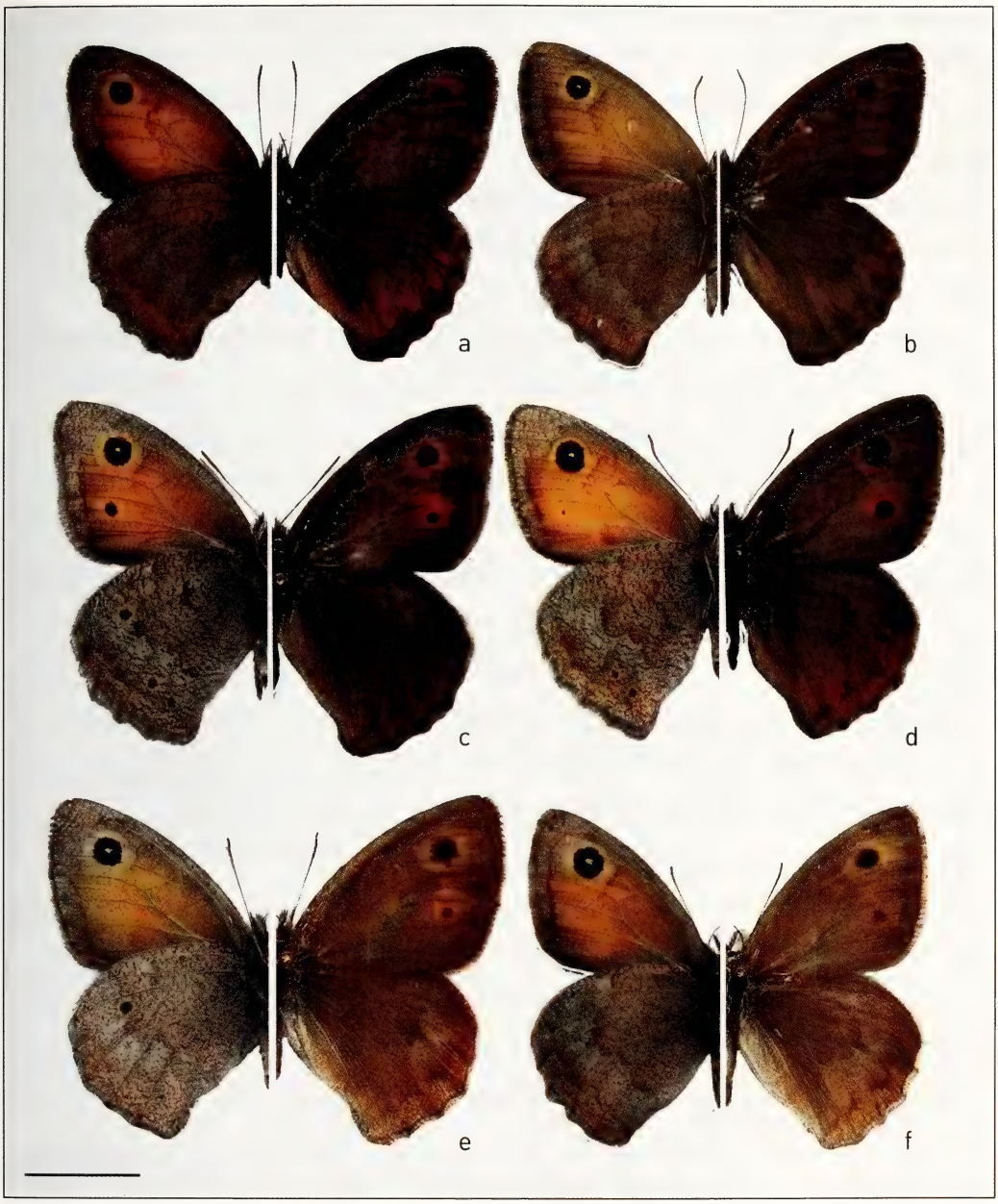

Fig. 26. *Hyponephele lycaon* in the Mongolian Altai (males): **a**: ssp. *smirnovi* Yakovlev, 2004, paratype (upper- and underside) (RYB), **b**: ssp. *smirnovi* Yakovlev, 2004, paratype (upper- and underside) (RYB), **c**: ssp. *dmitrievae* **ssp. n.**, holotype (upper- and underside) (ZISP), **d**: ssp. *dmitrievae* **ssp. n.**, paratype (upper- and underside) (RYB), **e**: ssp. *kerzhneri* **ssp. n.**, holotype (upper- and underside) (ZISP), **f**: ssp. *kerzhneri* **ssp. n.**, paratype (upper- and underside) (RYB).

Melitaea athene Staudinger, 1881.

Melitaea athene danae Churkin & Kolesnichenko, 2005

Arshantyn-Nuruu, Mogoin-Gol Valley. Very rare. vi–vii.

***Melitaea trivia* (Denis et Schiffermüller, 1775)**

Melitaea trivia singularia Korshunov, 1995

Arshantyn-Nuruu Mountains. Very rare. vi.

***Melitaea cinxia* (Linnaeus, 1758)**

Two subspecies: *tschujaca* Seitz, 1908 (northern and central part) and *mogoin* Churkin & Kolesnichenko, 2005 (southern slope). Local. vi.

***Melitaea arcesia* Bremer, 1861**

Two subspecies: *minor* Elwes, 1899 (northern part) and *dea* Churkin & Kolesnichenko, 2003 (southern slope and central part). Local. vi–vii.

***Melitaea phoebe* (Denis & Schiffermüller, 1775)**

Melitaea phoebe streltzovi Kolesnichenko & Yakovlev, 2004

Western part of the Dzungarian Gobi, Bulgan-Gol Valley. Local. vi–vii.

***Clossiana eunomia* (Esper, 1799)**

Clossiana eunomia asiatica (Staudinger, 1901)

Rather common. vi–vii.

***Clossiana selenis* (Eversmann, 1937)**

Clossiana selenis sibirica (Erschoff, 1870)

Kairty and Elt-Gol Valleys. Local. vi–vii.

***Clossiana selene* (Denis & Schiffermüller, 1775)**

Elt-Gol Valley. Rare and local. vii.

***Clossiana euphrosyne* (Linnaeus, 1758)**

Clossiana euphrosyne umbra Seitz, 1908

Chingiztei and Elt-Gol. Local. vi–vii.

***Clossiana freija* (Thunberg, 1791)**

Clossiana freija pallida (Elwes, 1899)

Elt-Gol and Shadzgat-Nuruu. Local and rare. vi–vii.

***Clossiana frigga* (Thunberg, 1791)**

Clossiana frigga alpestris (Elwes, 1899)

Elt-Gol Valley. Rare and local. vii.

***Clossiana dia* (Linnaeus, 1758)**

Clossiana dia alpina Elwes, 1899

Chumek, Hoton-Nuur and Elt-Gol. Local. vi–vii.

***Clossiana titania* (Esper, 1793)**

Clossiana titania staudingeri (Wnukowsky, 1929)

Kobdo-Gol Valley. Local. vii.

***Clossiana tritonia* (Boeber, 1812)**

Clossiana tritonia matveevi Korshunov & Gorbunov, 1995

Only one male near Tsagan-Kol lake. Very rare. vii. The subspecific rank of *matveevi* has been established (Dubatolov & Kosterin, 2010).

***Boloria frigidalis* Warren, 1944**

Elt-Gol. Very rare. vii.

* ***Boloria roddi* Kosterin, 2000**

Known from various parts of the Russian Altai, bordering with Mongolia (Ukok, Chuya valley, Koksu Valley).

***Boloria altaica* (Grum-Grshimailo, 1893)**

Alpine formations of the Mongolian Altai. Rare. vi–vii.

***Kuekenthaliella eugenia* (Eversmann, 1847)**

Malyj Sinij Irtysh Valley and Kobdo lake. Very local and rare. vii.

***Issoria lathonia* (Linnaeus, 1758)**

Sara-Syumbe, Arshantyn-Nuruu Mountains, Dayan-Nuur and Tsengel-Khairkhan Mountains. Rare. vi–vii.

***Brenthis ino* (Rottemburg, 1775)**

Brenthis ino paidicus Fruhstorfer, 1907

Local in Elt-Gol Valley, Arshantyn-Nuruu Mountains. Local. vi–vii.

***Brenthis daphne* (Denis & Schiffermüller, 1775)**

Recorded in the Chinese part (Meinhard, 1910) – Kok-Tegey Valley. Very local. vii.

***Brenthis hecate* (Denis & Schifermüller, 1775)**

Brenthis hecate warreni Kudrna, 1974

Arshantyn-Nuruu Mountains. Local. vi.

***Argynnis niobe* (Linnaeus, 1758)**

Argynnis niobe barkhatovi P. Gorbunov, 1995

Kobdo Lake and Malyj Sinij Irtysh Valley. Very local. vii.

***Argynnis adippe* (Rottemburg, 1775)**

Chinese part (Malyj Sinij Irtysh Valley), Local. vii.

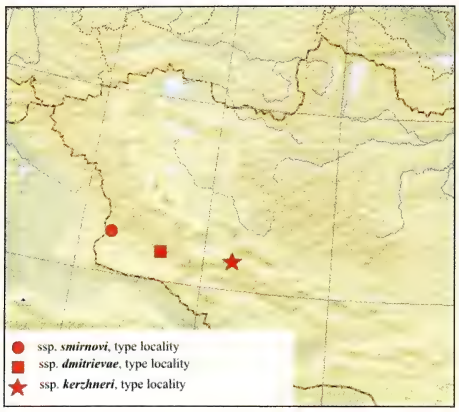

Fig. 27. Distribution of *Hyponephele lycaon* in the Mongolian Altai.

***Argynnis aglaja* (Linnaeus, 1758)**

Common in northern and central parts, vii.

Conclusions

Alltogether 178 butterfly species (Hesperiidae: 17; Papilionidae: 5; Pieridae: 17; Lycaenidae: 50; Nymphalidae: 86) have been recorded in the Mongolian Altai. Another six species are listed as possible.

The butterfly fauna of the Mongolian Altai comprises the following elements: Transpalaearctic, West Palaearctic, East Palaearctic, Dzhungarian, Southern Siberian, and Mongolian, as well as endemic species (16 species, or 9% of the total). Streching from the northwest to southeast, the Mongolian Altai is an important border for species distribution. Depending on their exposure, different habitats in the high zone result in substantially different fauna.

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Yazaki, Y. 2002. Satyridae. Supplement to Papilionidae, Nymphalidae and Pieridae – *In*: Butterflies of Mongolia, Publ. by K. Yazaki, Kitami, Japan **3**: 1–251. [In Japanese]

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Taxonomic and distributional remarks on some Palaearctic *Cydia* of the *succedana*-group with descriptions of two new species (Tortricidae)

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Abstract. Two new species, *Cydia transcaucasica* sp. n. and *Cydia suffuscana* sp. n., and a new subspecies, *Cydia centralasiae elegantana* ssp. n. are described and illustrated. We propose the synonymy of *Grapholitha succedana major* Caradja, 1916 with *Laspeyresia pamira* Obraztsov, 1943; the valid name of the taxon is *Cydia major* (Caradja, 1916). *Laspeyresia pamira centralasiae* Obraztsov, 1949 is a distinct species of the *succedana*-group, and its valid name is *Cydia centralasiae* (Obraztsov, 1949) stat. nov. = *Cydia intexta* (Kuznetzov, 1962), syn. nov.

Introduction

The *succedana*-group is one of the most difficult species complexes within *Cydia* in regards to correct species-level identifications. The status of some described taxa is unclear, with only subtle differences in facies and genitalia among some of the species. Nearly twenty species of the *succedana*-group are recorded from the Palaearctic, most of which occur in the Mediterranean area (Caradja 1916; Kennel 1921; Obraztsov 1943, 1949, 1959; Kuznetzov 1962; Danilevsky & Kuznetzov 1968; Sauter 1968; Căpuşe 1970; Diakonoff 1976; Gibeaux 1983; Burmann & Pröse 1988; Pröse 1988; Aarvik & Karsholt 1993; Komai 1999; Razowski 2003; Brown 2005).

A single specimen of the *succedana*-group with unusual colouration and wing pattern was collected on April 24, 2007 during a field trip to SW Bulgaria. We suspected that it represented an undescribed species, but additional material was needed before we could be certain. We collected three additional specimens from the same locality in 2008 and a longer series in 2010. An examination of their genitalia provided evidence that they belong to a new species, a description of which is given below. The specimens showed similarity with some Centralasiatic and Transcaucasian taxa from the *succedana*-group, which led us to study the types and other material of these taxa from the collections of the Zoological Institute of the Russian Academy of Sciences, the Zoological Museum of the Taras Shevchenko National University, and the Museum of Natural History "Grigore Antipa". As a result, we conclude that: 1) *Laspeyresia pamira* Obraztsov, 1943 is conspecific with *Grapholitha succedana major* Caradja, 1916 and the valid name of this taxon is *Cydia major* (Caradja, 1916); 2) the Transcaucasian specimen of *Laspeyresia pamira* Obraztsov, 1943 sensu Danilevsky & Kuznetzov (1968:

501, fig. 362b) is a new species; 3) *Laspeyresia pamira centralasiae* Obraztsov, 1949 is a distinct species, and the valid name of this taxon is *Cydia centralasiae* (Obraztsov, 1949) stat. nov. = *Cydia intexta* (Kuznetzov, 1962), syn. nov.; and 4) 18 specimens of *Laspeyresia pamira* from Zailiyskiy Alatau, Issyk *sensu* Danilevsky & Kuznetzov (1968: 502) belong to a new subspecies, *Cydia centralasiae elegantana* ssp. n.

Methods

Material from Bulgaria was collected with an aerial entomological net during afternoon when the moths were active and at light traps using UV fluorescent tubes. Genitalia dissections were made using standard procedures (Robinson 1976). For vesica eversion, the technique described by Zlatkov (2011) was applied.

Abbreviations

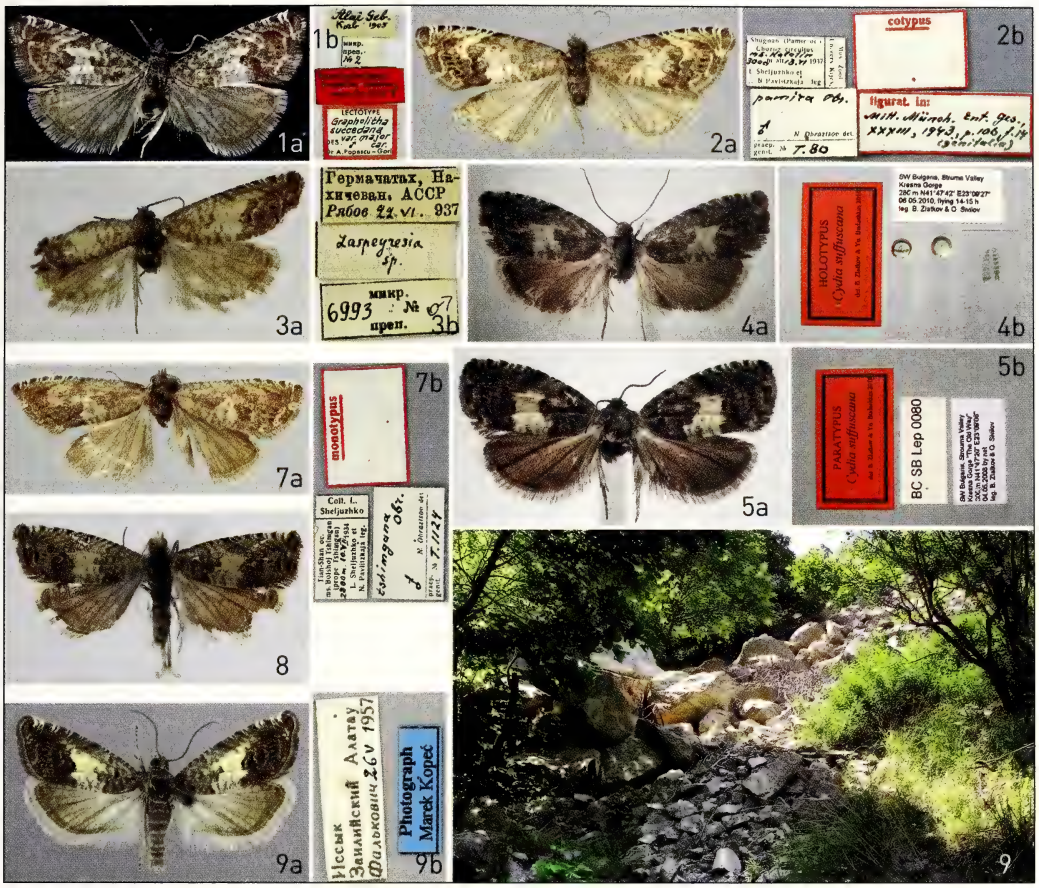
MNHGA	National Museum of Natural History "Grigore Antipa" (Bucharest, Romania)
NMNHS	National Museum of Natural History (Sofia, Bulgaria)
ZISP	Zoological Institute of the Russian Academy of Sciences (St. Petersburg, Russia)
ZMKU	Zoological Museum of the Taras Shevchenko National University (Kiev, Ukraine)

Cydia major (Caradja, 1916), stat. rev.

= *Cydia pamira* (Obraztsov, 1943), syn. nov.

Material. Lectotype ♂, with three labels: 'Alai Geb. | 1905, Korb'; 'Hololectotypus | Grapholitha succedana | major Car. (Rbl.), ♂'; 'Lectotype | Grapholitha | succedana | var. major | Car., ♂, des. | Dr. A. Popescu-Gorj', MNHGA. – Paralectotypes: ♀, with three labels: 'Alai Geb. | 1905, Korb'; 'Allolectotypus | Grapholitha succedana | major Car. (Rbl.), ♀'; 'România | Allolectotype | Grapholitha | succedana | var. major | Car., ♀, des. | Dr. A. Popescu-Gorj', MNHGA. ♂, with two labels: 'Alai Geb. | 1905, Korb'; 'România | Paralectotype | Grapholitha | succedana | var. major | Car., ♂, des. | Dr. A. Popescu-Gorj', MNHGA. ♀, with four labels: 'Shugnan (Pamir oc.) | mts ad fl. Shach-dara | (prope Chorog. supra pag. | Chabost) | 2800–3000 m, 25.vi.1937 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Mus. Zool. | Univers. Kijev'; 'cotypus'; 'pamira Obr. | ♀, N. Obraztsov det'; 'Lectotype | Laspeyresia pamira Obr. | des. B. Zlatkov & Yu. Budashkin', ZISP. ♂, with five labels: 'Shugnan (Pamir oc.) | mts ad fl. Shach-dara | (prope Chorog. supra pag. | Chabost) | 2800–3000 m, 29.vi.1937 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Mus. Zool. | Univers. Kijev'; 'cotypus'; 'pamira Obr. | ♂, N. Obraztsov det'; 'figurat. in: | Mitt. Münch. Ent. Ges. | XXXIII, 1943, t. IX, f. 5'; 'Paralectotype | Laspeyresia pamira Obr. | des. B. Zlatkov & Yu. Budashkin', ZMKU. ♀, with five labels: 'Shugnan (Pamir oc.) | mts ad fl. Shach-dara | (prope Chorog. supra pag. | Chabost) | 2800–3000 m, 26.vi.1937 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Mus. Zool. | Univers. Kijev'; 'cotypus'; 'pamira Obr. | ♀, N. Obraztsov det'; 'figurat. in: | Mitt. Münch. Ent. Ges. | XXXIII, 1943, t. IX, f. 6'; 'Paralectotype | Laspeyresia pamira Obr. | des. B. Zlatkov & Yu. Budashkin', ZMKU. ♂, with four labels: 'Shugnan (Pamir oc.) | mts ad fl. Shach-dara (prope Chorog. supra pag. | Chabost) | 2800–3000 m, 19.vi.1937 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Mus. Zool. | Univers. Kijev'; 'cotypus'; 'pamira Obr. | ♂, N. Obraztsov det' 'Paralectotype | Laspeyresia pamira Obr. | des. B. Zlatkov & Yu. Budashkin', ZMKU. ♂, with four labels: 'Shugnan (Pamir oc.) | Chorog circultus: ms. Kalotin | 3000 m, 13.vi.1937 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Mus. Zool. | Univers. Kijev'; 'cotypus'; 'pamira Obr. | ♂, N. Obraztsov det'; 'figurat. in: | Mitt. Münch. Ent. Ges. | XXXIII, 1943, p. 106, f. 14 | (genitalia)'; 'Paralectotype | Laspeyresia pamira Obr. | des. B. Zlatkov & Yu. Budashkin', ZMKU. ♂, with three labels: '2100–2600 m | Chatkal'sk. gorno- | lesnoy zap. Uzbek. | 9.vi.963, Sugonjaev' – in Russian; 'ostepnjon. ju. | sklon s kustarn. | i archjoi' – in Russian; 'Laspeyresia | pamira Obr. [V. I. Kuznetzov hand]', ZISP.

Taxonomic, morphological, and distributional remarks. The original description of *major* Caradja, 1916 is: "G[rapholitha] succedana var. major Ral. <*sic*> i. l. ist eine



Figs 1–9. Type specimens and labels. **1**. *Grapholitha succedana major* Caradja, 1916, ♂ (lectotype, Kyrgyzstan: Alai Mts.). **2**. *Laspeyresia pamira* Obraztsov, 1943, ♂ (paralectotype, Tajikistan: Western Pamir). **3**. *Cydia transcaucasica* sp. n., ♂ (holotype, Azerbaijan: Germachatah). **4**. *Cydia suffuscana* sp. n., ♂ (holotype, SW Bulgaria: Kresna Gorge). **5**. *Cydia suffuscana* sp. n., ♀ (paratype, SW Bulgaria: Kresna Gorge). **6**. The habitat of *Cydia suffuscana* sp. n. in Kresna Gorge. **7**. *Laspeyresia pamira centralasiae* Obraztsov, 1949, ♂ (lectotype, Eastern Uzbekistan: Tshimgan). **8**. *Laspeyresia intexta* Kuznetzov, 1962, imago, ♂ (holotype, Western Kazakhstan). **9**. *Cydia centralasiae elegantana* ssp. n., ♂ (holotype, Eastern Kazakhstan: Zailijskij Alatau). a, imago; b, labels.

schöne, bedeutend grössere Form, mit sehr breitem Dorsalfleck und sehr stark weiss dürchsetzten Vfln. 2 ♂♂, 1 ♀ vom Alaigebirge." (Caradja 1916: 68). The original description of *Laspeyresia pamira* Obraztsov, 1943 is based on five specimens (3 ♂♂, 2 ♀♀) from Western Pamir (Shugnan) (Obraztsov 1943: 105). An examination of all type material reveals that these two taxa are conspecific (Figs 1, 2). This species is the largest representative of the *succedana*-group (forewing length 8.7–11.5 mm). The most diagnostic character of the male genitalia is the process of the phallus which is very large, 0.3–0.4 the length of the distal part of the phallus (Fig. 10). The shape of the valva and its structures are also diagnostic, especially the angle of the sacculus (without a distinct tooth), the relatively deep ventral incision of the valva, and the small cucullus. However, the inferior angle of the cucullus may bear a short tooth, or this

structure may be absent (individual variation). The female genitalia of this species are distinguished by a long, relatively narrow and undivided postvaginal plate (postostial part of sterigma) (Fig. 15).

The identities of these two taxa were established by Obraztsov (1959); he proposed *C. pamira* (Obraztsov, 1943) as the valid name for them because he considered *C. major* (Caradja, 1916) as already occupied and unavailable. However, *major* (Caradja, 1916) was not previously used in this genus by other authors. Consequently, we consider the name *C. major* (Caradja, 1916) the oldest one for these taxa, and therefore this name has the priority. We establish *Cydia pamira* (Obraztsov, 1943), syn. nov. as the new synonym of *Cydia major* (Caradja, 1916), stat. rev. An examination of museum specimens revealed that *C. major* (Caradja, 1916) is limited to Kyrgyzstan (Alai Mts.), Uzbekistan (Chatkal Mts.), and Tajikistan (Pamir: Shugnan).

Cydia transcaucasica Budashkin & Zlatkov, sp. n.

Material. Holotype ♂, 'Germachatah Na- | hichevan. ASSR | 22.vi.937, Rjabov' in Russian, ZISP.

Description. Adult (Fig. 3). *Head*: Vertex, frons, and antennae covered with pale-greyish scales; labial palpi pale-greyish with terminal segment darker. *Thorax*: Covered with pale-greyish scales; forewing length 8.5 mm; forewing narrow, apically angled; upperside of the wing with basal field almost grey with several indistinct lighter transverse lines; dorsal patch very large, apically extended to the wing apex, with indistinct boundaries, whitish in colour, having two or three grey, indistinct dividing lines present only near the anal edge of the wing; main colour of external wing field dark grey; numerous (approximately nine) pairs of white costal strigulae present on costal edge from the basal part to the apex, the distal three or four strigulae more distinct; five short subcostal metallic lines with whitish-grey lustre start from the fifth to the ninth pair of costal strigulae; the first of these lines connected with the internal line of the speculum, the third and the fifth almost reach the external line of speculum; lines of the speculum have the same colour; the external line of speculum divided into two sections the inferior of which shorter than the superior one; four or five small black lines (or rows of large dots) present in the speculum; three small blackish spots located between dorsal patch and internal line of speculum; relatively indistinct creamy-whitish subapical (postapical strigula) and subterminal markings present; cilia paler than the main wing colour; hindwing brownish-grey; cilia brownish-grey with darker basal line. *Abdomen*: Male genitalia (Fig. 11) with relatively broad valva, costa almost straight; ventral incision relatively shallow with round angles; sacculus angle obtuse, lacking a tooth; cucullus almost as wide as basal part of valva; inferior angle of cucullus rounded, lacking tooth; distal half of sacculus, neck of valva and inferior edge of cucullus covered with short scale-like setae; cucullus densely covered with long hair-like setae; phallus straight in distal part, bearing short, smooth process on right side, about 0.2 times length of distal part of phallus; vesica with some small cornuti.

Female. Unknown.

Diagnosis. Externally, *C. transcaucasica* sp. n. is easily distinguished by its relatively large wingspan, light colouration, and very large whitish dorsal patch. The male genita-

lia are most similar to *C. albipicta* (Sauter, 1968), but valva broader; *C. transcaucasica* sp. n. have a short and smooth process of the phallus, which is lacking in *C. albipicta*. Sexual dimorphism is unknown (the species is known from male only).

Habitat. Unknown.

Distribution. Known from the type locality only: Transcaucasia, Azerbaijan, Nakhichivan, Germachata.

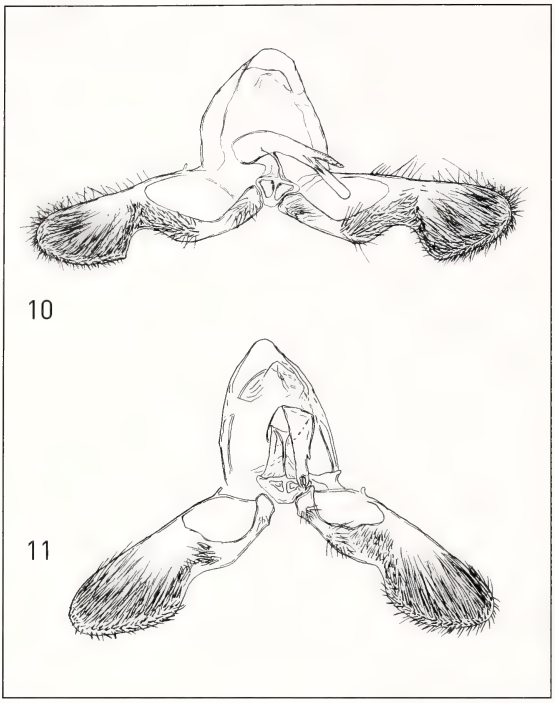
Life history. The holotype was collected on 22.vi.1937.

Etymology. The name is derived from the type locality in Transcaucasia.

Cydia suffuscana Zlatkov & Budashkin, sp. n.

Material. Holotype ♂, with two labels: 'SW Bulgaria, Struma Valley | Kresna Gorge | 280 m N 41°47'42" E 23°09'27" | 06.05.2010, flying 14–15 h | leg. B. Zlatkov & O. Sivilov', 'HOLOTYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010' [red label]; two plastic containers with genitalia and a plastic slide with abdominal sclerites are attached beneath the specimen, NMNHS. – Paratypes: ♂, with three labels: 'SW Bulgaria, Strouma Valley | Kresna Gorge near Kresna Inn | 260 m N41°47.41' E023°09.39' | 24.04.2007, 16–21 h', 'BC SB Lep 0079', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', coll. B. Zlatkov. 1♂, 1 ♀ each with two labels: 'SW Bulgaria, Strouma Valley | Kresna Gorge "The Old Way" | 300 m N 41°47'20" E 23°09'06" | 04.05.2008 by net | leg. B. Zlatkov & O. Sivilov', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', coll. Yu. Budashkin. 1 ♀ with three labels: 'SW Bulgaria, Strouma Valley | Kresna Gorge "The Old Way" | 300 m N 41°47'20" E 23°09'06" | 04.05.2008 by net | leg. B. Zlatkov & O. Sivilov', 'BC SB Lep 0080', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', coll. B. Zlatkov. 4 ♂♂, 2 ♀♀ each with two labels: 'SW Bulgaria, Struma Valley | Kresna Gorge | 280 m N 41°47'42" E 23°09'27" | 06.05.2010, flying 14–15 h | leg. B. Zlatkov & O. Sivilov', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', 2 ♂♂ coll. B. Zlatkov, 2 ♂♂, 2 ♀♀ coll. Yu. Budashkin. 1 ♀ with two labels: 'SW Bulgaria, Struma Valley | Kresna Gorge | 280 m N 41°47'53" E 23°09'26" | 06.05.2010, net | leg. B. Zlatkov & O. Sivilov', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', coll. B. Zlatkov. 4 ♂♂, 1 ♀, each with two labels: 'SW Bulgaria, Struma Valley | Kresna Gorge | 280 m N 41°47'42" E 23°09'27" | 06.05.2010, in light trap | leg. B. Zlatkov & O. Sivilov', 'PARATYPUS | *Cydia suffuscana* | det. B. Zlatkov & Yu. Budashkin 2010 [red label]', NMNHS.

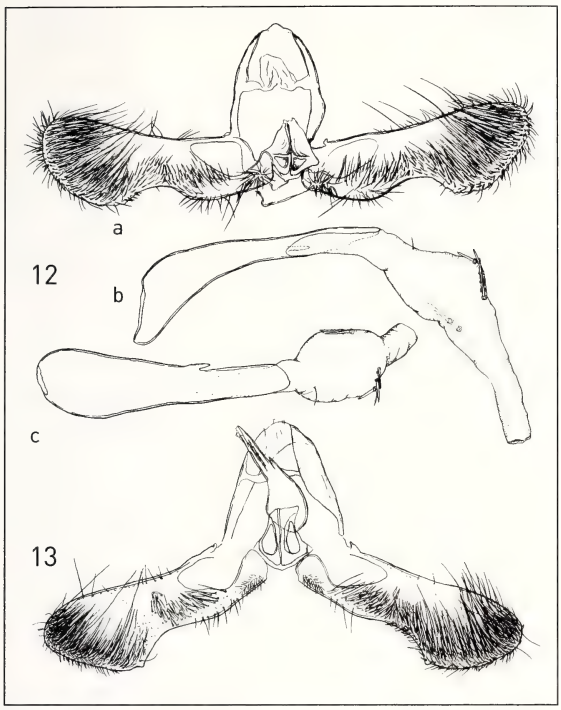
Description. Adult (Figs 4, 5). *Head*: Scales around the compound eyes and labial palpi light grey with terminal joint darker; the remaining part of head covered with grey-brown scales; antennae dark brown, almost black. *Thorax*: Patagia and tegula dark-brown, almost black; forewing length 6.8–7.1 mm in males, 7.2–7.5 mm in females; forewing relatively wide and rounded, apically more angled in males and rounder and wider in females; basal field almost black, with 2–3 indistinct lighter transverse lines; dorsal patch distinct, with rough boundaries, white with light creamy hue; two or three grey-brown transverse lines divided by darker intermediate lines starting from two pairs of grey costal strigulae and ending at the dorsal patch; distal five pairs of costal strigulae with the same colour as dorsal patch; the last with a dark-grey dividing line, present only near the anal edge of the wing; main colouration of external wing field dark-brown, consisting of brown scales with ochreous tips; two subcostal metallic lines with bluish lustre extending from fifth and seventh costal strigulae, not connected to concolorous lines of speculum; external line of speculum divided into two sections, inferior of which almost half as long as superior; speculum with four or five black lines, scales between lines light ochreous with brown bases; two oblong black spots, sometimes adjoining at their superior ends, located between dorsal patch and internal line of speculum; creamy-white or yellowish postapical strigula present, sometimes divided



Figs 10–11. Male genitalia of representatives of *succedana*-group. **10**. *Laspeyresia pamira* Obraztsov, 1943, male genitalia (paralectotype, Tajikistan: Western Pamir). **11**. *Cydia transcaucasica* sp. n., male genitalia (holotype, Azerbaijan: Germachata). After Danilevsky & Kuznetzov (1968), Fig. 362 b, left valva added after the genitalia slide.

into two spots; two other concolorous markings sometimes present in termen alongside inferior ends of sections of external speculum line; cilia slightly paler than the main wing colour; hindwing dark-brown with paler base; cilia brownish-grey with darker basal line. *Abdomen*: Dark-brown, almost black. Male genitalia (Fig. 12). Costa almost straight, slightly concave; inferior edge with shallow incision with round angles; sacculus angle obtuse, lacking tooth; width of valva in basal area approximately three-quarters width at cucullus; cucullus relatively large; inferior angle of cucullus rounded, either without tooth or with two or three minute teeth; one of paratypes with distinct tooth on each valva (Fig. 13); distal half of sacculus, neck of valvae, and inferior edge of cucullus covered with short scale-like setae and dense covering of long hair-like setae; phallus 0.61 mm in length, straight in distal part, bearing short smooth process ca. 0.25 times as long as distal part of phallus, distal third of phallus membraneous ventrally; everted vesica of the holotype (Figs 12b, c) ca. 0.35 mm in length, with cylindrical proximal part and bulbous distal part; gonopore apically located; one small seta located subdorsally on the border between the two parts of vesica; bulbous part bearing two groups of (fixed?) cornuti, larger group consisting of 5 dorsolaterally located (on the left side), smaller group consisting of two almost flat cornuti longer than those of larger group located ventrolaterally (on the right side); all cornuti oriented anteriorly. Female genitalia (Fig. 14) with genital plate (anteostial part of sterigma) with slightly convex anterior edge with triangular incisions, convergent lateral edges, and deeply incised posterior edge; incision of posterior edge round, about 2/3 as long as plate; entire surface of genital plate covered with numerous pore-like structures; plate well sclerotised except for band around ostium; postvaginal plate (postostial part of sterigma) as long as genital plate, twice as long as wide; plate narrowed in postmedial area, then widened, with rough posterior edge; ductus bursae with sclerotised plate (cingulum) on ventral face and right side, reaching ductus seminalis; end of ductus bursae with an asymmetrical zone of numerous sclerotised spines – right part longer and closer to ductus seminalis; signa equal in size, relatively short.

Diagnosis. Externally, *C. suffuscana* sp. n. is easily distinguished by its relatively large wingspan, wide wings, dark colouration, and distinctly outlined white dorsal patch.



Figs 12–13. Male genitalia of *Cydia suffuscana* sp. n. 12. Holotype (SW Bulgaria: Kresna Gorge); a, genitalia with phallus removed; b, c, phallus with vesica everted, enlarged; b, lateral view; c, dorsal view. 13. Paratype (SW Bulgaria: Kresna Gorge).

In the male genitalia, the new species is similar to *C. major* (especially the form of the valva and the size of the cucullus), but *C. suffuscana* sp. n. has a much smaller lateral process of the phallus and a shallower ventral incision of the valva. In the female genitalia, the sterigma in both species is also similar, but the genital plate is more sclerotised in *C. suffuscana* sp. n. and differs in the shape of the postostial part of the sterigma. The colouration of *C. suffuscana* sp. n. readily differentiates it from all other similar species of the *succedana* group. Sexual dimorphism is almost absent.

Habitat (Fig. 6). All specimens were collected in a small area of the Kresna Gorge in southwestern Bulgaria. In general, the gorge is dry and rocky, but the specimens were collected in a relatively humid, shady gully on a steep, rocky slope at 300 m altitude. The moths were collected at late afternoon flying around rocks. A few specimens were collected in a light trap, i.e., they also are active at night. The dominant plants are *Tilia* sp. and *Lunaria* sp., with *Jasminum fruticans* L., *Coronilla emerus* L., *Pistacia terebinthus* L., and *Quercus pubescens* Willd. as minor components. A single female was collected from a similar gully 300 m to the north.

Distribution. Known only from the type locality.

Life history. Host plants unknown. Moths were collected from late April through early May.

Etymology. The specific name comes from the Latin word suffuscus (=brownish, dark) because of the main colour of the moth.

Cydia centralasiae (Obraztsov, 1949), stat. n., bona sp.

= *Cydia intexta* (Kuznetzov, 1962), syn. nov.

Material. Holotype ♂, with four labels: 'Tian-Shan oc. | ms. Bolshoj Tshimgan | (prope Tshimgan) | 2800, 10.vii.1934 | L. Sheljuzhko et | N. Pavlitzkaja leg. | Coll. L. | Sheljuzhko'; 'monotypus'; 'tshimgana Obr. | ♂, N. Obraztsov det. | praep. genit. N T. 1124'; 'Holotype | Laspeyresia pamira | centralasiae Obr. | des. B. Zlatkov & Yu. Budashkin' (ZMKU). Paratype ♀, with six labels: 'Tian-Shan oc. | jug. Karzhantau | prope Kzyl-topoch | 23.vi.1940 | V. Obuchova leg. | Mus. Zool. Univers. Kijev.'; 'Karzhantau | na tipchak. | stepi pod Kzyl topoch | 23.vi.1940, Obuchova' – in Russian; 'autotypus'; 'Laspeyresia | pamira tshimgana Obr.'; '♀, tshimgana Obr. | N. Obraztsov det.'; 'Paratype | Laspeyresia pamira | centralasiae Obr. | des. B. Zlatkov & Yu. Budashkin', ZMKU. Other materials: ♂, with two labels: 'Zapadno-

Kazahstanskaja obl. | Kamenskij r-n | okolo vysoty 251 | 24.V.1949, na svet | M. F. Martynova' – in Russian; 'Holotypus | Laspeyresia intexta Kuzn. | V. Kuznetzov det.', ZISP. ♂, with two labels: 'Turkmenskaja SSR | Ashhabadskaja obl., okr. Kara-Kala | Igdezhdik i sev. sklon g. Sjunt | 400–900 m, 25.iv.1953, V.I. Kuznetsov' – in Russian; 'Paratypus | Laspeyresia intexta Kuzn. | V. Kuznetzov det.', ZISP. 3 ♂♂, 'Ukraine, zapovednik | "Kamennyje Mogily" | 5, 10,14.06.1995, na svet | leg. A. Zhakov' – in Russian, ZMKU. ♂, 'Crimea, cap Kazantip | lum.| 10.05.1996, leg. Yu. Budashkin', Karadag Nature Reserve collection. 5 ♂♂, 'SW Bulgaria, Strouma Valley | karst formation near Ilindentsi | Village, UTM: FM81 | 475 m N41°39'01" E023°15'05" | 20.05.2008 at light | leg. B. Zlatkov', coll. B. Zlatkov. 1 ♀, 'BG, Strouma valley | Roupite place near Petrich, | Kozhuh hill, 100 m | N41°27.867' E23°15.425' | 13.05.2006, 19–22 h | leg. B. Zlatkov', coll. B. Zlatkov. 1 ♀, 'SW Bulgaria, Strouma Valley | Roupite place near Petrich – | volcanic hill of Kozhuh | 200 m N41°27.72' E023°15'50' | 15.05.2007', coll. B. Zlatkov. 3 ♂♂, 2 ♀♀, 'SW Bulgaria, Strouma Valley | Roupite place near Petrich – | volcanic hill of Kozhuh | 200 m N41°27'39" E23°15'24" | 19.05.2008 at light | leg. B. Zlatkov', coll. B. Zlatkov.

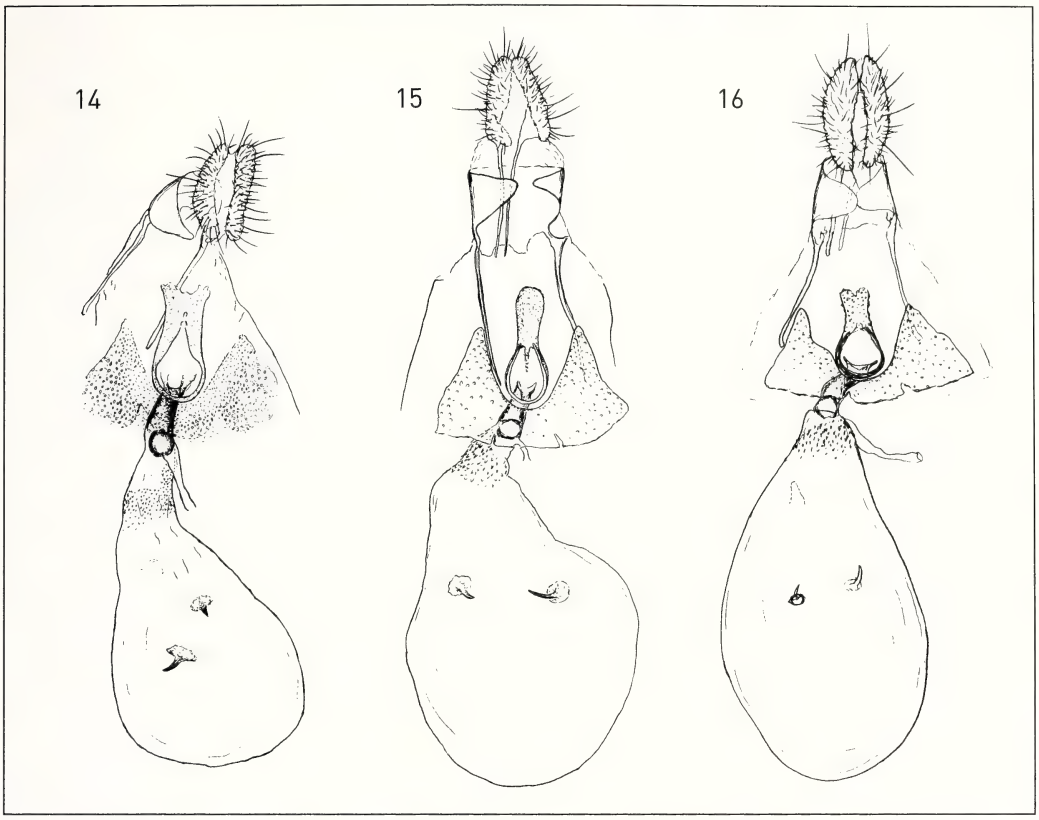
Morphological and taxonomic remarks. The taxon *centralasiae* Obraztsov, 1949 was described as a subspecies of *Laspeyresia pamira* (Obraztsov, 1943) from the Western Tian-Shan mountains (Eastern Uzbekistan) based on two specimens (the male holotype and a female paratype) (Obraztsov 1949). The genitalia slide of the holotype is missing. The taxon *intexta* Kuznetzov, 1962 was described from 14 males from Western Kazakhstan (type locality), Southern Ural, Turkmenistan, and Austria. Razowski (2003) described the female of *C. intexta* from Turkmenistan. After studying the above-cited material and publications, we conclude that these two taxa are conspecific. This species has a forewing length of 6.5–7.5 mm and has typical *succedana*-group forewing colouration (with a moderate whitish dorsal patch) (Figs 7, 8). A specific character in the male genitalia (Fig. 17) is the small lateral process of the phallus, situated on the right side near the middle. The process is ca. 0.17–0.25 times the length of the distal part of the phallus. The ventral incision of the valva is very deep, the sacculus angle lacks a tooth, and the cucullus is comparatively large. A short tooth may be present or absent at the inferior angle of the cucullus (individual variation). The everted vesica pointed ventrolaterally, with widened middle section bearing a compact group of four fixed socketed cornuti subdorsally located and a single subventral cornutus. In the female genitalia, the postvaginal plate (postostial part of sterigma) is relatively short, wide, and undivided (Fig. 16).

Distribution. Spain, France, Italy, Switzerland, Austria, Czech Republic, Slovakia, Bulgaria, Ukraine, Russia (Middle Volga reg., Volgo-Don reg., S. Ural), Turkmenistan, Western Kazakhstan (Zlatkov & Budashkin 2010), Eastern Uzbekistan, Eastern Kazakhstan (distinct ssp. n. – see below).

Cydia centralasiae elegantana Budashkin & Zlatkov, ssp. n.

Material. Holotype ♂, 'Issyk | Zailijskij Alatau | "prilavki" | 26.V.957, Falkovitsh' – in Russian (ZISP). – Paratypes: 11 ♂, 'Issyk 1000–1100 m | Zailijskij Alatau | "prilavki" | 26–28.V.957, Falkovitsh' – in Russian, ZISP.

Description. Adult (Fig. 9). *Head*: Covered with greyish scales; labial palpi pale grey with darker terminal segment; antennae with greyish scales. *Thorax*: Greyish; forewing length 6.5–7.0 mm; forewing very narrow, angled apically; basal field greyish with several indistinct paler transverse lines; dorsal patch relatively narrow, barely extending to apex, with distinct boundaries and whitish colour; dorsal patch with two or



Figs 14–16. Female genitalia of representatives of *succedana*-group. **14**. *Cydia suffuscana* sp. n., female genitalia (paratype from Fig. 5). **15**. *Grapholitha succedana major* Caradja, 1916, female genitalia (paralectotype, Kyrgyzstan: Alaigebirge). **16**. *Cydia centralasiae* (Obraztsov, 1949), stat. n., bona sp., female genitalia (SW Bulgaria: Kozhuh hill).

three indistinct grey dividing lines near anal edge of wing; main colouration of external wing field dark-grey; numerous (approximately nine) pairs of white costal strigulae on costa from base to apex, four to five distally located strigulae more distinct; five to six short subcostal metallic lines with lead-grey lustre from fifth to ninth pairs of costal strigulae; first of lines connected with internal line of speculum, third and fifth lines almost reaching external line of speculum; speculum lines concolorous; external line of speculum divided into two sections, inferior section shorter than superior; four to seven comparatively large black lines (or relatively large spots) in speculum; seven to nine relatively large blackish spots between dorsal patch and internal line of speculum; distinct, creamy-whitish subapical and subterminal markings present; cilia paler than main wing colour; hindwing greyish with darker distal part; cilia greyish, with darker basal line. *Abdomen*: Male genitalia with valva comparatively short, wide; costa slightly concave; ventral incision deep; sacculus angle lacking tooth; cucullus larger than basal part of valva; short tooth present or absent at inferior angle of cucullus (individual variation); distal half of sacculus, neck of valvae, and inferior edge of cucullus covered with short scale-like and long hair-like setae; phallus straight in distal part, bearing short

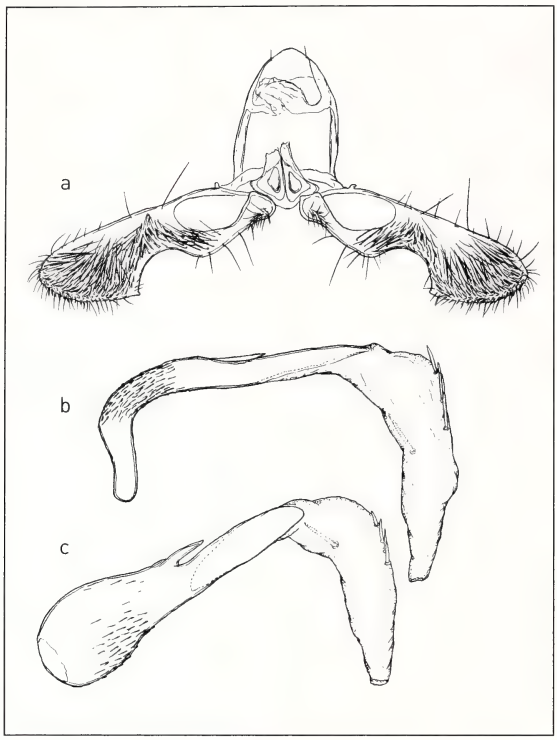


Fig. 17. Male genitalia of *Cydia centralasiae* (Obraztsov, 1949), stat. n., bona sp. (SW Bulgaria: Kozhuh hill); **a**, genitalia with phallus removed; **b**, **c**, phallus with vesica everted, enlarged; **b**, lateral view; **c**, dorsal view.

smooth process on right side; process ca. 0.17–0.25 as long as distal part of phallus; some small cornuti present in vesica.

Female. Unknown.

Diagnosis. *C. centralasiae elegantana* ssp. n. can be distinguished from the nominate subspecies by its narrower and more contrasting forewing and its paler hindwing. The male genitalia are nearly identical to those of *C. centralasiae centralasiae* (Obraztsov, 1949). Sexual dimorphism is unknown (known from male only).

Habitat. Type series was collected at 1000–1100 m.

Distribution. Known from the type locality only: Eastern Kazakhstan, Zailijskij Alatau, Issyk.

Life history. The type series was collected 26–28.v.1957.

Etymology. The subspecific name comes from relatively narrow and finely contrasted forewings (from Latin: elegans = elegant, fine, handsome).

Remarks. According to Danilevsky & Kuznetzov (1968: 502), M. I. Falkovitsh collected 18 specimens of this taxon in 1957; however, we could find only 12 of the specimens in ZISP.

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O. Kudrna, A. Harpke, K. Lux, J. Pennerstorfer, O. Schweiger, J. Settele, and M. Wiemers 2011. Distribution Atlas of Butterflies in Europe. – Gesellschaft für Schmetterlingsschutz, Halle, Germany. ISBN 978-3-938249-70-3. Price: 65,– € plus shipping costs*.

This book represents the second, completely re-written, revised and much improved edition of O. Kudrna's very well-known "Distribution Atlas of European Butterflies" from 2002.

The Preface (Chapter 1) is followed by an introductory part (Chapter 2) which details the complex procedure of transforming data submitted, or made available in many different formats, into a computer-friendly format. There is also a list of all contributors.

The most important part of the main text of this Atlas, however, is devoted to the clarification of procedures followed while producing the checklist of European butterfly species (Chapter 3). Whereas nomenclature (i.e., which name is to be used to designate any given taxon) is exactly codified by the International Code of Zoological Nomenclature, taxonomy (i.e., which taxa should be recognised as distinct) is indeed a highly subjective branch of science.

The limits of genera are fixed by their monophyly, which in some cases is only supposed. The authors decided to use very broad genera, often encompassing a number of sub-lineages, which other authors may subjectively decide to keep separate. Some outstanding problems, particularly arising with some lycaenid genera, are briefly discussed on pp. 26–27, and on pp. 33–39.

The limits of species are even more problematic. The subspecies concept, as endearing as it can be to some taxonomists, has no biological basis and to repeat the well-known joke, in zoological lists "if you have three names, you are either a butterfly or a bird". The use of the subspecies rank can be viewed as a measure of our ignorance and should be limited to cases of very imperfectly known faunas. No "subspecies" have been recognised in this Atlas, and very correctly so.

Clearly the authors had to make decisions of what could and what could not be mapped, and have decided to stick to a somewhat "Linnean" vision of the species, at least for the moment. Modern DNA studies keep demonstrating that a number of once apparently well-established species are in fact dual taxa, the ranges of which are often insufficiently known to be represented on maps (e.g., *Leptidea sinapis*/*L. reali*/ *L. juvernica*, or *Melitaea phoebe*/*M. telona*, etc.). The same criterion has also been applied to some "morphospecies", even in cases where they are known to differ in their genitalic, or other structural features. A checklist of species recognised for the purposes of this Atlas is given on pp. 27–33 and 39–43. The most important synonyms, and other unrecognised species, are listed on pp. 43–45.

Species distributions (Chapter 4) are individually depicted in 441 maps of excellent quality, where their occurrence is shown for each of the 4121 quadrats 0.5° (latitude) × 1° (longitude) which collectively compose the European (excluding the Russian and the Icelandic) part of their range. Butterflies occurring in the Gibraltar area are not mapped because data were unavailable at the time when maps were assembled, but are listed on p. 45 of the Atlas. Supposedly extinct "populations" are shown as red (before 1950) or yellow (1951–1980) dots. The level of accuracy of the latter is occasionally disputable. A short discussion of the zoogeography and conservation status of each species is appended under each map, together with some additional comments on the species' taxonomy, where appropriate. Maps are arranged alphabetically by genus and species names, which will sometimes require the reader to refer to the index.

Chapter 5 contains a short analysis of results obtained in the recording phase. Of course, the geographical distribution of the butterfly fauna is better known in some European countries than in others. The type and level of information, as it was known to the authors, is alphabetically listed on a country by country basis. It is rather a pity that the authors were in some cases unable to retrieve some important sources of information, for example from Italy, where the distribution atlas of butterflies (and many other animal groups) has already reached its second edition. The chapter continues with a discussion of the zoogeography of European butterfly species, which includes two interesting "coincidence maps" (Figs 7, 8) showing European hotspots of butterfly diversity. The following paragraph, dealing with conservation, summarises what is currently known on this extremely important issue regarding the European area.

To summarise, apart from some small glitches which could not be avoided in a book having such a broad scope, the authors of the "Distribution Atlas of Butterflies in Europe" should be thanked for their efforts and congratulated over their results. This book should be included in the library of every serious lepidopterist, irrespectively of whether amateur or professional.

Emilio Balletto

* The order can be placed online at http://www.european-butterflies.ufz.de/index.php?de=22179.

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